

Indicator Definitions and Drug Codes

Acute Myocardial Infarction (AMI)

The average annual age- and sex-adjusted rate of hospitalization or death due to AMI (also known as heart attack) per 1,000 residents age 40 and older was calculated for two five-year time periods: 2007–2011 and 2012–2016. AMIs were defined by one of the following conditions:

- an inpatient hospitalization with the most responsible diagnosis of AMI and a length of stay of three or more days (unless the patient died in hospital)
- a death with AMI listed as the primary cause of death on the Vital Statistics death record

Diagnosis codes used to identify an AMI include ICD–9–CM code 410 and ICD–10–CA code I21. Hospitalizations for less than three days were excluded as likely “rule out” AMI cases; transfers between hospitals were tracked to ensure all “true” AMI cases staying at least three days in hospital(s) were counted. The denominator includes all Manitoba residents age 40 and older as of December 31 of each year (2007–2016).

Admission to Personal Care Home (PCH)

The age- and sex-adjusted average annual percent of residents 75 and older who were admitted to a personal care home (PCH) for the first time was calculated for two two-year time periods: 2010/11–2011/12 and 2015/16–2016/17. The denominator includes all Manitoba residents 75 and older as of December 31 of each year. Region assignment in the numerator was based on current postal code and municipal code, which was determined by the location of the PCH. Misericordia and Churchill Hospital Long-Term Care patients were included.

Hospital Days for Alternate Level of Care (ALC) Stays

The age- and sex-adjusted rate of ALC hospital days (reported in hospital abstracts) per 1,000 people was calculated for fiscal years 2011/12 and 2016/17.

Only hospitalizations of Manitoba residents in Manitoba hospitals were included; personal care homes (PCHs), nursing stations, and long-term care facilities were excluded (Deer Lodge Centre, Manitoba Adolescent Treatment Centre, Rehabilitation Centre for Children, and Riverview Health Centre). Newborn hospitalizations were excluded. The denominator includes all Manitoba residents as of December 31, 2011 and 2016.

Long lengths of stay (acute and ALC) in people under 50 years of age were over-inflating the age- and sex- adjusted rates in smaller districts. To improve rates the extreme values (outliers) were truncated to the value of 95th percentile.

Ambulatory Consultations

The age- and sex-adjusted rate of ambulatory consultations per Manitoba resident was calculated for fiscal years 2011/12 and 2016/17. Consultations to family physicians, specialists, and nurse practitioners were included. The definition of a consultation is an ambulatory visit with one of the following tariff codes:

- 8440 orthopaedic spinal consultation
- 8449 extended ophthalmology consultation for the assessment and/or treatment of uveitis
- 8550 consultation
- 8552 developmental assessment and report per 15 minute period or portion thereof
- 8553 psychiatry consultation—adult
- 8554 psychiatry consultation—child
- 8556 ophthalmology consultation, including refraction and other necessary tests (family physician or optometrist)
- 8557 otorhinolaryngology (ENT) consultation
- 8622 consultation, geriatric patient
- 8620 extended consultation (incl. requests by Geriatric Program Assessment Team, GPAT), minimum of 45 minutes of patient/physician contact time.
- 8107 consultation initiated by Allied Health Professionals to RN (EP).
- 8108 consultation initiated by RN (EP) to Allied Health Professionals.
- 8139 consultation initiated by Family Physician to RN (EP).
- 8140 consultation RN (EP) to RN (EP).

The denominator includes all Manitoba residents as of December 31, 2011 and 2016.

Ambulatory Visits to Physicians and Nurse Practitioners

The age- and sex-adjusted rate of ambulatory visits to physicians and nurse practitioners per resident was calculated for fiscal years, 2011/12 and 2016/17. Prenatal visits, office visits, walk-in clinics, home visits, personal care home (PCH; nursing home) visits, and visits to outpatient departments were included. The denominator includes all Manitoba residents as of December 31, 2011 and 2016.

Antidepressant Prescription Follow-Up

The crude (unadjusted) percent of residents with a new prescription for antidepressants (ATC code N06A) and a diagnosis of depression (ICD-9-CM codes 296 or 311) within two weeks of each other (it is assumed that the prescription date comes after the physician visit) who then had three subsequent ambulatory visits within four months of the prescription being filled was calculated for two five-year time periods: 2007/08–2011/12 and 2012/13–2016/17. To be included in the analysis, patients had to be alive for the entire follow-up period. To be included as a newly depressed patient, residents could not have a prescription for antidepressants or a physician visit with a diagnosis of depression in the two years prior to the index event.

Arthritis

The age- and sex-adjusted prevalence of arthritis was calculated for residents 19 and older in two two-year time periods: 2010/11–2011/12 and 2015/16–2016/17. Arthritis was defined by one of the following conditions:

- one or more hospitalizations with a diagnosis of arthritis: ICD–9–CM codes 274, 446, 710–721, 725–729, 739; ICD–10–CA codes M00–M03, M05–M07, M10–M25, M30–M36, M65–M79
- two or more physician visits with a diagnosis of arthritis (ICD–9–CM codes as above)
- one physician visit with a diagnosis of arthritis (ICD–9–CM codes as above) and two or more prescriptions for medications to treat arthritis (listed below)

The denominator includes all Manitoba residents 19 and older as of December 31, 2011 and 2016.

List of drug Anatomic Therapeutic Chemical (ATC) codes and generic drug names used to treat arthritis:

- A07EC01 - Sulfasalazine
- C01EB03 - Indometacin
- H02AB04 - Methylprednisolone
- H02AB06 - Prednisolone
- H02AB07 - Prednisone
- H02AB08 - Triamcinolone
- H02AB10 - Cortisone
- L01BA01 - Methotrexate
- L04AA13 - Leflunomide
- L04AA24 - Abatacept
- L04AB01 - Etanercept
- L04AB02 - Infliximab
- L04AB04 - Adalimumab
- L04AB05 - Certolizumab Pegol
- L04AB06 - Golimumab
- L04AC03 - Anakinra
- L04AC07 - Tocilizumab
- L04AD01 - Cyclosporine
- L04AX01 - Azathioprine
- M01AB01 - Indometacin
- M01AB02 - Sulindac
- M01AB03 - Tolmetin
- M01AB05 - Diclofenac
- M01AB08 - Etodolac
- M01AB15 - Ketorolac
- M01AB55 - Diclofenac, combinations
- M01AC01 - Piroxicam
- M01AC02 - Tenoxicam
- M01AC06 - Meloxicam
- M01AE01 - Ibuprofen
- M01AE02 - Naproxen
- M01AE03 - Ketoprofen
- M01AE04 - Fenoprofen
- M01AE09 - Flurbiprofen

- M01AE11 - Tiaprofenic Acid
- M01AE12 - Oxaprozin
- M01AG01 - Mefenamic Acid
- M01AH01 - Celecoxib
- M01AH02 - Rofecoxib
- M01AH03 - Valdecoxib
- M01AX01 - Nabumetone
- M01CB01 - Sodium Aurothiomalate
- M01CB03 - Auranofin
- M01CB04 - Aurothioglucose
- M01CC01 - Penicillamine
- M02AA15 - Diclofenac
- M02AC - Preparations with salicylic acid derivatives
- N02AA59 - Codeine, combinations excluding psychotropic drugs
- N02AA79 - Codeine Phosphate
- N02AJ06 - Codeine Phosphate
- N02AJ07 - Codeine Phosphate and Caffeine Citrate
- N02AJ13 - Acetaminophen
- N02AJ17 - Oxycodone Hydrochloride
- N02AJ18 - Oxycodone Hydrochloride
- N02BA01 - Acetylsalicylic Acid (Tablet Strength > 325 mg)
- N02BA11 - Diflunisal
- N02BE01 - Acetaminophen
- N02BE51 - Acetaminophen, Combinations Excluding Psychotropic Drugs
- P01BA02 –Hydroxychloroquine

Asthma

The age- and sex-adjusted prevalence of asthma was calculated for residents age 5 to 19 years for fiscal years 2010/11-2011/12 and 2015/16-2016/17. Asthma was defined by one of the following conditions:

- one or more hospitalizations with a diagnosis of asthma: ICD-9-CM code 493; ICD-10-CA code J45.
- one or more physician visits with a diagnosis of asthma (ICD-9-CM code as above)
- one or more prescriptions for medications to treat asthma (listed below)

The denominator includes all Manitoba residents age 5 to 19 years as of December 31, 2011 and 2016.

List of included drug Anatomic Therapeutic Chemical (ATC) codes and generic drug names used to treat asthma:

- R03AA01 - Epinephrine
- R03AB02 - Isoproterenol Hydrochloride
- R03AB03 - Orciprenaline Sulfate
- R03AC02 - Salbutamol
- R03AC03 - Terbutaline Sulfate
- R03AC04 - Fenoterol Hydrobromide
- R03AC08 - Pirbuterol Acetate Inhalation
- R03AC12 - Salmeterol
- R03AC13 - Formoterol Fumarate

- R03AC16 - Procaterol Hcl Hemihydrate
- R03AC18 - Indacaterol Maleate
- R03AK06 - Salmeterol/Fluticasone
- R03AK07 - Budesonide/Formoterol
- R03AK09 - Formoterol Fumarate Dihydrate/Mometasone Furoate
- R03AK10 - Fluticasone Furoate/Vilanterol Trifenatate
- R03AL01 - Fenoterol Hydrobromide/Ipratropium Bromide
- R03BA01 - Beclomethasone Dipropionate
- R03BA02 - Budesonide
- R03BA03 - Flunisolide
- R03BA05 - Fluticasone Propionate
- R03BA06 - Triamcinolone Acetonide
- R03BA07 - Mometasone Furoate
- R03BA08 - Ciclesonide
- R03BC01 - Sodium Cromoglycate
- R03BC03 - Nedocromil Sodium
- R03CB03 - Orciprenaline Sulfate
- R03CC02 - Salbutamol
- R03CC03 - Terbutaline Sulfate
- R03CC04 - Fenoterol Hydrobromide
- R03DA02 - Oxtriphylline
- R03DA04 - Theophylline
- R03DA05 - Aminophylline
- R03DA54 - Alcohol Anhydrous/Oxtriphylline
- R03DB04 - Phenobarbitone (Tal) and Theophylline
- R03DC01 - Zafirlukast
- R03DC03 - Montelukast
- R03DX05 - Omalizumab
- R03DX07 - Roflumilast
- R03DX09 - Mepolizumab
- R03DX10 - Benralizumab
- R06AX17 - Ketotifen Fumarate

Asthma Care: Controller Medication Use

The crude (unadjusted) percent of residents treated for asthma that filled a prescription for medications recommended for long-term control of asthma was calculated for fiscal years 2011/12 and 2016/17. Asthmatics were defined as individuals with a repeat prescription (i.e., two or more) for beta 2-agonists (ATC codes R03AA, R03AB or R03AC). Long-term asthma medications include inhaled corticosteroids (ATC code R03BA), leukotriene modifiers (ATC code R03DC) and adrenergics, and other drugs for obstructive airway diseases (ATC code R03AK). Patients receiving ipratropium bromide (ATC codes R01AX03, R03AK04, R03BB01) were excluded as likely COPD patients.

Benzodiazepine Dispensations

The crude (unadjusted) percent of seniors 75 and older who filled at least two prescriptions for benzodiazepines or at least one prescription for benzodiazepines with a greater than 30 day supply was calculated for fiscal years 2010/11-2011/12 and 2015/16-2016/17. Benzodiazepines were defined using

ATC N05BA, N05CD, N05CF, and N03AE01. Separate rates are provided for community-dwelling seniors, and seniors residing in Personal Care Homes (PCH). If a resident lived in a PCH for one or more days during the study period, they were categorized as a senior residing in a PCH; otherwise they were considered to be living in the community. PCHs with hospital-based pharmacies, including the pharmacy in Churchill PCH, are excluded from this analysis as their prescription data were unavailable. The denominator includes all Manitoba residents 75 and older as of April 1, 2011 and 2016. If an individual died during the fiscal year, then prescriptions are looked at one year before death.

Birth Rate

The age-adjusted rate of births per 1,000 women was calculated for female residents age 15 to 45 years for fiscal years 2011/12 and 2016/17. Births were defined as live births in Manitoba hospitals with ICD-10-CA codes Z37.0, Z37.2, Z37.3, Z37.5. The denominator includes all Manitoba female residents age 15 to 45 years as of December 31, 2011 and 2016.

Breastfeeding Initiation

The maternal age-adjusted breastfeeding initiation rate was calculated for fiscal years 2011/12 and 2016/17. Breastfeeding initiation was defined as exclusive or partial breastfeeding at hospital discharge. The denominator includes all live births in Manitoba hospitals (ICD-10-CA code Z38). Stillborn births and records with missing breastfeeding initiation were excluded.

Caesarean Section

The maternal age-adjusted rate of caesarean sections was calculated for fiscal years 2010/11-2011/12 and 2015/16-2016/17. Caesarean delivery was defined by a hospitalization in a Manitoba hospital with CCI code 5.MD.60. The denominator includes all births (live and still) in Manitoba hospitals (ICD-10-CA codes Z37).

Cardiac Catheterization (Diagnostic Angiogram)

The average annual age- and sex-adjusted rate of cardiac catheterizations per 1,000 residents age 40 and older was calculated for two 3-year time periods: 2009/10-2011/12 and 2014/15-2016/2017. Cardiac catheterization was defined by hospitalizations with CCI code 3.IP.10. The denominator includes all Manitoba residents age 40 and older as of December 31 of each year (2009-2011 and 2014-2016). Cardiac catheterizations were only performed at the two tertiary hospitals (Health Sciences Centre and St. Boniface General Hospital), so only hospitalizations from those two hospitals were included in the analysis in order to eliminate the potential for double-counting of interventions. To further reduce double-counting, only interventions that were not marked Out of Hospital, or OOH, were included.

Cataract Surgery

The age- and sex-adjusted rate of cataract surgeries per 1,000 residents age 50 and older was calculated for fiscal years 2011/12 and 2016/17. Cataract surgery was defined by a physician claim with physician tariff codes 5611, 5612 and tariff prefix "2" (surgery) or a hospitalization with ICD-9-CM procedure codes 13.11, 13.19, 13.2, 13.3, 13.41, 13.42, 13.43, 13.51, and 13.59 or CCI code 1.CL.89. Additional cataract

surgeries for Manitoba residents were added from medical reciprocal claims out-of-province, including Alberta (tariff code 27.72) and Saskatchewan (tariff codes 135S, 136S, 226S, and 325S). The denominator includes all Manitoba residents age 50 and older as of December 31, 2011 and 2016.

Causes of Ambulatory Visits

The most frequent reasons for ambulatory visits in fiscal years 2011/12 and 2016/17. Each visit has only one diagnosis code recorded as the "reason" for the visit, and these diagnoses were grouped by ICD-9-CM chapter. The most frequent causes are shown for each Regional Health Authority (RHA) and the province overall (shown as average annual crude/unadjusted percent).

The infrequent causes, and those ambulatory visits with missing cause (i.e. no diagnosis code was recorded, or they were recorded as pregnant but sex was male) were grouped into the "All Others" cause category.

As of RHA 2018 this indicator includes visits to family physicians, specialists, and nurse practitioners.

The ICD-9-CM diagnoses codes were grouped into causes as follows:

- Cause 1 - Infectious and Parasitic Diseases (ICD-9-CM: 001-13999)
- Cause 2 - Cancer (ICD-9-CM: 140-23999)
- Cause 3 - Endocrine & Metabolic Diseases (ICD-9-CM: 240-27999)
- Cause 4 - Disorders of Blood (ICD-9-CM: 280-28999)
- Cause 5 - Mental Illnesses (ICD-9-CM: 290-31999)
- Cause 6 - Nervous System (ICD-9-CM: 320-38999)
- Cause 7 - Circulatory System (ICD-9-CM: 390-45999)
- Cause 8 - Respiratory System (ICD-9-CM: 460-51999)
- Cause 9 - Digestive System (ICD-9-CM: 520-57999)
- Cause 10 - Genitourinary System (ICD-9-CM: 580-62999)
- Cause 11 - Pregnancy & Birth
 - ICD-9-CM: 630-67999; OR
 - Sex: 2 and tariff: 8400, 8401, 8402, or 8416; OR
 - Sex: 2 and diagnosis ICD-9-CM: V22, V23, V24, V27, V28, or V91"
 - Note: Pregnancy and Birth "overrides" the classification of some codes. For example, V22, V23, etc. for females would be classified as Cause 18 if we did not manually change their classification.
- Cause 12 - Disorders of Skin (ICD-9-CM: 680-70999)
- Cause 13 - Musculoskeletal System (ICD-9-CM: 710-73999)
- Cause 14 - Congenital Anomalies (ICD-9-CM: 740-75999)
- Cause 15 - Conditions Originating in Perinatal Period (ICD-9-CM: 760-77999)
- Cause 16 - Symptoms, Signs & Ill-Defined Conditions (ICD-9-CM: 780-79999)
- Cause 17 - Injury & Poisoning (ICD-9-CM: 800-99999)
- Cause 18 - Factors Influencing Health Status and Contact (ICD-9-CM: V01-V9199)
- Cause 19 - External Causes of Injury (ICD-9-CM: E800-E9999)
- Cause 99 -All Others
 - '' (Missing); OR
 - Pregnant male; OR
 - Infrequent causes
 - Other codes (e.g., incorrect codes)

Causes of Child Mortality

The most frequent causes of death for Manitobans age 1 to 19 in two 5-year time periods: 2007–2011 and 2012–2016. Causes of death from the Vital Statistics death records were grouped by ICD–10 chapter, and the most frequent causes are shown for each Regional Health Authority (RHA) and the province overall (shown as average annual crude/unadjusted percent). Records that do not specify a cause of death are included in the category “All Others”.

Causes of Day Surgery

The most frequent reasons for day surgery, defined as surgical services received on an outpatient basis in acute care facilities, reported for fiscal years 2011/12 and 2016/17. Each hospital abstract has a “most responsible” diagnosis—the diagnosis that describes the most significant condition of a patient who required day surgery. These diagnoses were grouped by ICD–10–CA chapter.

Causes of Death

The most frequent causes of death for Manitobans in two 5-year time periods: 2007–2011 and 2012–2016. Causes of death from the Vital Statistics death records were grouped by ICD–10 chapter, and the most frequent causes are shown for each Regional Health Authority (RHA) and the province overall (shown as average annual crude/unadjusted percent). “Circulatory” diseases include heart attack and stroke. Records that do not specify a cause of death are included in the category “All Others”.

Causes of Hospital Days Used for Acute Care

The most frequent reasons for hospital *days* coded only as Acute Care (i.e., no ALC days) during inpatient hospitalizations in fiscal years 2011/12 and 2016/17. Each hospital abstract has a most responsible diagnosis—a diagnosis that describes the most significant condition of a patient that contributed his or her days in hospital. Most responsible diagnoses were grouped by ICD–10–CA chapter, and the most frequent causes are shown for each Regional Health Authority (RHA) and the province overall (shown as average annual crude/unadjusted percent).

Causes of Inpatient Hospitalization (Acute Care)

The most frequent reasons for inpatient hospitalization in acute care facilities in fiscal years 2011/12 and 2016/17. Each hospital abstract has a most responsible diagnosis—a diagnosis that describes the most significant condition of a patient that contributed to his or her stay in hospital but may not necessarily be the admitting diagnosis. Most responsible diagnoses were grouped by ICD–10–CA chapter, and the most frequent causes are shown for each Regional Health Authority (RHA) and the province overall (shown as average annual crude/unadjusted percent).

Causes of Premature Death

The most frequent causes of premature death for Manitobans age 0 to 74 in two 5-year time periods: 2007–2011 and 2012–2016. Causes of death from the Vital Statistics death records were grouped by ICD–10 chapter, and the most frequent causes are shown for each Regional Health Authority (RHA) and the

province overall (shown as average annual crude/unadjusted percent). Records that do not specify a cause of death are included in the category “All Others”.

Child Mortality

The average annual age- and sex-adjusted rate of deaths per 1,000 residents age 1 to 19 years was calculated for two 5-year time periods: 2007–2011 and 2012–2016. The denominator includes all Manitoba residents as of December 31 of each year (2007–2016). Infant mortality rates are examined separately.

Computed Tomography (CT) Scans

The age- and sex-adjusted rate of CT scans per 1,000 residents age 20 and older was calculated for fiscal year 2016/17. CT scans were defined by a physician claim with tariff codes 7112–7115 and 7221–7230. To count person-visits, only one scan per day is counted, as there could be multiple body parts scanned, each with their own claim. The denominator includes all Manitoba residents age 20 and older as of December 31, 2016. CT scan rates shown in this report under-estimate the “true” rates, as individual-level information regarding CT scans performed in some rural hospitals are not complete.

Congestive Heart Failure (CHF)

The age- and sex-adjusted prevalence of CHF was calculated for residents age 40 and older for fiscal years 2011/12 and 2016/17. Residents were considered to have CHF if they met one of the following conditions:

- one or more inpatient hospitalizations with a diagnosis for CHF: ICD–9–CM code 428, ICD–10–CA code I50
- two or more physician visits with a diagnosis for CHF (ICD–9–CM code as above)

The denominator includes all Manitoba residents age 40 and older as of December 31, 2011 and 2016.

Continuity of Care Index

The Continuity of Care Index (COCI) weighs both the frequency of ambulatory visits to primary care providers (which includes family physicians and nurse practitioners, mdbloc=11, 200) and the dispersion of ambulatory visits between family physicians and nurse practitioners. The possible index values range from just greater than zero (where visits are made to different physicians) to one (all visits made to the same physician). Residents with fewer than three ambulatory visits over the three-year period were excluded. Values were calculated for 2009/10–2011/12 and 2014/15–2016/17 and were age- and sex-adjusted to the Manitoba population in the first time period.

Coronary Artery Bypass Surgery

The average annual age- and sex-adjusted rate of bypass surgeries per 1,000 residents age 40 and older was calculated for two 5-year time periods: 2007/08-2011/12 and 2012/13-2016/17. Bypass surgeries were defined by hospitalizations CCI code 1.IJ.76. The denominator includes all Manitoba residents age 40 and older as of December 31 of each year (2007-2016). These surgeries were only performed at the two

tertiary hospitals (Health Sciences Centre and St. Boniface General Hospital), so only hospitalizations from those two hospitals were included in the analysis in order to eliminate the potential for double-counting of interventions. "Out of hospital" interventions were excluded to avoid double-counting.

Day Surgery

The age- and sex-adjusted rate of day surgery hospitalizations per 1,000 residents was calculated for fiscal years 2011/12 and 2016/17. Multiple admissions of the same person were counted as separate events. All Manitoba hospitals were included; personal care homes (PCHs), nursing stations, and long-term care facilities were excluded (Deer Lodge Centre, Manitoba Adolescent Treatment Centre, Rehabilitation Centre for Children, and Riverview Health Centre). In cases of birth, newborn hospitalizations were excluded (the mother's hospitalization was included). The denominator includes all Manitoba residents as of December 31, 2011 and 2016.

Dental Extractions Among Children

The annual average crude (unadjusted) rate of dental extractions per 1,000 residents age 0 to 5 years for fiscal years 2007/08-2011/12 and 2012/13-2016/17. Dental extractions were defined by a hospitalization with an ICD-9-CM procedure code: 23.01, 23.09, 23.11, 23.19 or CCI code: 1.FE.57, 1.FE.89 ATC N05BA, N05CD, N05CF, N03AE01. Only interventions in Manitoba hospitals that were not marked "Out of Hospital" were included. The denominator includes all Manitoba residents age 0 to 5 years as of December 31, 2007-2016. We did not have access to records for any pediatric dental extractions performed outside of hospitals (e.g., in dentists' offices) and so the rates reported here may underestimate the extent of severe early childhood tooth decay.

Diabetes

The age- and sex-adjusted incidence and prevalence of diabetes was calculated for residents (of all ages) in two 3-year time periods: 2009/10-2011/12 and 2014/15-2016/17. The age- and sex-adjusted prevalence of diabetes was also calculated for seven 3-year time periods 1996/97-1998/99 to 2014/15-2016/17. Diabetes was defined by one of the following conditions:

- one or more hospitalizations with a diagnosis of diabetes: ICD-9-CM code 250, ICD-10-CA codes E10-E14
- two or more physician visits in two years with a diagnosis of diabetes (ICD-9-CM code as above)
- one or more prescriptions for medications to treat diabetes (ATC code A10, specific drugs that were included are listed below) UNLESS the prescriptions are all for metformin (ATC code A10BA) without any other diabetes prescriptions, no diagnoses for diabetes from a hospital or physician visit, no high HgA1c test, and no record in the Diabetes Education Resource for Children and Adolescents.
- one or more glycohemoglobin (HgA1c) tests with a result ≥ 6.5
- identified as having Type I or Type II diabetes in the Diabetes Education Resource for Children and Adolescents.

For the two period prevalence, the denominator includes all Manitoba residents as of December 31, 2010 and 2015. For the seven period prevalence, the denominator includes all Manitoba residents as of

December 31, 1997, 2000, 2003, 2006, 2009, 2012, and 2015. For incidence, only residents at risk of developing the disease were included in the analysis, and rate of new cases was calculated per 100 person-years at risk. A 3-year wash-out period prior to the start of the study years was used to distinguish between prevalent and incident cases, and residents had to be registered with Manitoba Health for the entire 3-year period to be included in the analysis. This measure of diabetes combines type 1 and type 2 diabetes, as physician claims data do not allow separate identification. Gestational diabetes has a separate diagnosis code and is not specifically included here, but some cases may be included if gestational diabetes was not properly coded.

List of drug Anatomic Therapeutic Chemical (ATC) codes and generic drug names used to treat diabetes:

- A10A - Insulins and Analogues
- A10BA02 - Metformin
- A10BB01 - Glibenclamide
- A10BB02 - Chlorpropamide
- A10BB03 - Tolbutamide
- A10BB09 - Gliclazide
- A10BB12 - Glimepiride
- A10BB31 - Acetohexamide
- A10BD03 - Metformin and Rosiglitazone
- A10BD04 - Glimepiride and Rosiglitazone
- A10BD07 - Metformin and Sitagliptin
- A10BD10 - Metformin and Saxagliptin
- A10BD11 - Metformin and Linagliptin
- A10BF01 - Acarbose
- A10BG02 - Rosiglitazone
- A10BG03 - Pioglitazone
- A10BH01 - Sitagliptin
- A10BH03 - Saxagliptin
- A10BH05 - Linagliptin
- A10BJ01 - Exenatide
- A10BJ02 - Liraglutide
- A10BK01 - Dapagliflozin
- A10BK02 - Canagliflozin
- A10BK03 - Empagliflozin
- A10BX02 - Repaglinide
- A10BX03 -Nateglinide

Diabetes Care: Eye Examination

The crude (unadjusted) percent of residents with diabetes (all ages –determined from the diabetes prevalence indicator) who had an eye exam in a year was calculated for fiscal years 2011/12 and 2016/17. Eye exams were defined as a physician visit to an ophthalmologist or an optometrist visit in the medical claims data.

Although all residents with diabetes qualify for annual eye exams without having to pay for the service, some may not indicate their diabetic status to the provider, in which case the provider may bill the patient directly. If that occurs, there would be no record of the visit in medical claims data. Furthermore, services provided by family physicians could not be included, as there is no specific tariff for this service. As a result, this indicator under-estimates eye exam rates to some degree.

Hepatitis C Virus (HCV)

The age- and sex-adjusted point prevalence of HCV was calculated as of December 31, 2017. HCV cases were defined as Manitoba residents whom, as of December 31, 2017, had one or more positive laboratory tests for HCV since August 31, 2009. The definition for a positive laboratory test was developed in partnership with Cadham Provincial Laboratory and Manitoba Health, Seniors and Active Living. The denominator is all Manitoba residents as of December 31, 2017.

It is important to note that we were unable to distinguish between acute HCV infection, and chronic HCV infection when determining the prevalence estimates but it is assumed that most people would not be tested for HCV until they begin to show symptoms, indicating a chronic HCV infection. It is possible that when a person is tested for HCV, antibodies from a previous acute infection are detected and signal a positive test. We also did not link to the prescription drug data to determine who may have received treatment for their HCV infection, between the time of diagnosis and December 31, 2017. Treatment did not become widespread until after our date of interest, so it was determined treatment would have been negligible for this group. Finally, using August 31, 2009 as our start date limits our estimate to those people with positive tests for HCV after this date; thus, we fail to capture anyone diagnosed before August 31, 2009 who did not have a subsequent positive test within the period of interest.

Hip Replacement

The average annual age- and sex-adjusted rate of hip replacement surgeries (complete removal of the ball and socket of the hip joint) per 1,000 residents age 40 and older was calculated for two 5-year time periods: 2007/08–2011/12 and 2012/13–2016/17. Hip replacement surgeries were defined by hospitalizations with ICD–9–CM procedure codes 81.50, 81.51 and 81.53 and CCI codes 1.VA.53.LA–PN and 1.VA.53.PN–PN. To reduce double-counting, only interventions that were not marked Out of Hospital, or OOH, were included. The denominator includes all Manitoba residents age 40 and older as of December 31 of each year (2007–2016).

Hospital Catchment (Hospitalizations and Days)

Information regarding where hospital patients came from with respect to each geographic region. Of all hospitalizations (or days) from all hospitals in each Regional Health Authority (RHA), this is the percent that were provided to: (1) RHA residents, (2) residents of other RHAs, (3) Winnipeg residents, and (4) out-of-province residents. The catchment of hospitalizations was calculated for fiscal years 2011/12 and 2016/17. If a patient is transferred between hospitals, each stay is counted as a separate event and the hospitalization (or days) is attributed to the appropriate hospital. Hospitalizations attributed to Non-Manitoba residents were included. For this analysis, the postal code information from the hospital abstract collected at time of hospitalization was used to assign residents to RHAs rather than sourced from the Manitoba Health Insurance Registry. The Registry is usually the gold standard, but does not always capture all moves within the province if they are not reported and this discrepancy can be more noticeable when measuring indicators in less populated regions.

Hospital Days for Acute Care

The age- and sex-adjusted rate of acute hospital days per 1,000 people was calculated for fiscal years 2011/12 and 2016/17. Acute hospital days were calculated by subtracting the number of alternate level care (ALC) days from the total number of days a patient stayed in hospital.

Only hospitalizations of Manitoba residents in Manitoba hospitals were included; personal care homes (PCHs), nursing stations, and long-term care facilities were excluded (Deer Lodge Centre, Manitoba Adolescent Treatment Centre, Rehabilitation Centre for Children, and Riverview Health Centre). Newborn hospitalizations were excluded. The denominator includes all Manitoba residents as of December 31, 2011 and 2016.

Hospital Episodes

The age- and sex-adjusted rate of inpatient hospital episodes per 1,000 residents (age 0-19) was calculated for fiscal years 2010/11-2015/16. Transfers within the same hospitalization were not counted as separate events. Only hospitalizations of Manitoba residents in Manitoba hospitals were included; personal care homes (PCHs), nursing stations, and long-term care facilities were excluded (Deer Lodge Centre, Manitoba Adolescent Treatment Centre, Rehabilitation Centre for Children, and Riverview Health Centre). Newborn hospitalizations were excluded. The denominator includes all Manitoba residents age 0-19 as of December 31, 2011 and 2016.

Hospital Location (Hospitalizations and Days)

Information regarding where Regional Health Authority (RHA) residents went for hospitalizations by the following categories: (1) percent of hospitalizations in patient's RHA, (2) percent of hospitalizations in another RHA, (3) percent of hospitalizations in a Winnipeg hospital, and (4) percent of hospitalizations outside of Manitoba. The location of hospitalizations was calculated for fiscal years 2011/12 and 2016/17. If a patient is transferred between hospitals, each stay is counted as a separate event and the hospitalization (or days) is attributed to the appropriate hospital. Only hospitalizations attributed to Manitoba residents were counted. For this analysis, the postal code information from the hospital abstract collected at time of hospitalization was used to assign residents to RHAs rather than sourced from the Manitoba Health Insurance Registry. The Registry is usually the gold standard, but does not always capture all moves within the province if they are not reported and this discrepancy can be more noticeable when measuring indicators in less populated regions.

Hospital Readmissions

The age- and sex-adjusted percent of hospital *episodes* that had a readmission within 1 to 30 days of discharge was calculated for fiscal years 2011/12 and 2016/17. Hospital episodes combine multiple inpatient admissions of the same person to create a single, continuous stay in the hospital system, irrespective of transfers between hospitals (readmissions less than 24 hours after discharge were considered to be part of the same hospital episode). Only unplanned inpatient readmissions were counted, defined by admission category "U" for urgent/emergent admissions. All Manitoba hospitals were included; personal care homes (PCHs), nursing stations, and long-term care facilities were excluded (Deer Lodge Centre, Manitoba Adolescent Treatment Centre, Rehabilitation Centre for Children, and Riverview Health Centre). Out-of-province hospitalizations for Manitoba residents were not included. In cases of

birth, both the newborn and the mother's hospitalizations were included as index hospitalizations. The denominator includes all Manitoba residents hospitalized in fiscal years 2011/12 and 2016/17.

Hospitalizations for Ambulatory Care Sensitive (ACS) Conditions

The age- and sex-adjusted rate of inpatient hospitalizations for ACS conditions (defined below) per 1,000 residents age 0 to 74 was calculated for fiscal years 2011/12 and 2016/17. For all ACS conditions (except congenital syphilis), the ACS condition must be coded as the most responsible diagnosis. ACS conditions are a group of 25 diseases and diagnoses for which it is thought that timely and effective outpatient care can reduce the risk of hospitalization. These conditions include asthma, angina, gastroenteritis, and congestive heart failure. The grouping was created by Billings and colleagues [1,2], but has been revised over time. All Manitoba hospitals were included; personal care homes (PCHs), nursing stations, and long-term care facilities were excluded (Deer Lodge Centre, Manitoba Adolescent Treatment Centre, Rehabilitation Centre for Children, and Riverview Health Centre). Out-of-province hospitalizations for Manitoba residents were also included. Individuals who died in hospital were excluded from the numerator. The denominator includes all Manitoba residents age 0 to 74 as of December 31, 2011 and 2016.

ACS conditions include:

- Congenital Syphilis: ICD-9-CM code 090, ICD-10-CA code A50 (newborns only)
- Immunization-related and Preventable Conditions: ICD-9-CM codes 033, 037, 045, 390, 391; ICD-10-CA codes A35, A37, A80, I00, I01 (also including hemophilus meningitis for children age 1 to 5 only: ICD-9-CM code 320.0; ICD-10-CA code G00.0)
- Epilepsy: ICD-9-CM code 345, ICD-10-CA codes G40, G41
- Convulsions: ICD-9-CM code 780.3, ICD-10-CA code R56
- Severe ENT Infections: ICD-9-CM codes 382, 462, 463, 465, 472.1; ICD-10-CA codes H66, J02, J03, J06, J312 (cases of otitis media: ICD-9-CM code 382, ICD-10-CA code H66, with a procedure code for myringotomy with insertion of tube are excluded: ICD-9-CM procedure code 20.01, CCI code 1.DF.53.JA-TS)
- Pulmonary Tuberculosis: ICD-9-CM code 011; ICD-10-CA codes A15.0, A15.1, A15.2, A15.3, A15.7, A15.9, A16.0, A16.1, A16.2, A16.7, A16.9
- Other Tuberculosis: ICD-9-CM codes 012-018; ICD-10-CA codes A15.4, A15.5, A15.6, A15.8, A16.3, A16.4, A16.5, A16.8, A17, A18, A19
- Chronic Obstructive Pulmonary Disease (COPD): ICD-9-CM codes 491, 492, 494, 496; ICD-10-CA codes J41, J42, J43, J44, J47 (also included in 2005/06 are patients with a primary diagnosis of acute lower respiratory infection: ICD-10-CA codes J10.0, J11.0, J12-J16, J18, J21, J22; and a secondary diagnosis of COPD with acute lower respiratory infection: ICD-10-CA code J44)
- Acute Bronchitis (only included if a secondary diagnosis of COPD is also present, diagnosis codes as above): ICD-9-CM code 466.0, ICD-10-CA code J20
- Bacterial Pneumonia: ICD-9-CM codes 481, 482.2, 482.3, 482.9, 483, 485, 486; ICD-10-CA codes J13, J14, J15.3, J15.4, J15.7, J15.9, J16, J18 (patients with a secondary diagnosis of sickle-cell anaemia: ICD-9-CM code 282.6; ICD-10-CA codes D57.0, D57.1, D57.2, D57.8 and patients less than two months of age are excluded)

- Asthma: ICD-9-CM code 493, ICD-10-CA code J45
- Congestive Heart Failure: ICD-9-CM codes 402.01, 402.11, 402.91, 428, 518.4; ICD-10-CA codes I50, J81 (patients with certain cardiac procedures coded are excluded: ICD-9-CM procedure codes 36.01, 36.02, 36.05, 36.1, 37.5, 37.7; CCI codes 1.HB.53, 1.HB.54, 1.HB.55, 1.HD.53, 1.HD.54, 1.HD.55, 1.HZ.53, 1.HZ.55, 1.HZ.85, 1.IJ.50, 1.IJ.57.GQ, 1.IJ.76)
- Hypertension: ICD-9-CM codes 401.0, 401.9, 402.00, 402.10, 402.90; ICD-10-CA codes I10.0, I10.1, I11 (patients with certain cardiac procedures coded are excluded, procedure codes as in CHF)
- Angina: ICD-9-CM codes 411.1, 411.8, 413; ICD-10-CA codes I20, I23.82, I24.0, I24.8, I24.9 (patients with any surgical procedure coded are excluded)
- Cellulitis: ICD-9-CM codes 681, 682, 683, 686; ICD-10-CA codes L03, L04, L08, L44.4, L88, L92.2, L98.0, L98.3 (patients with any surgical procedure coded are excluded, except for incisions of skin and subcutaneous tissue: ICD-9-CM procedure code 86.0; CCI codes 1.AX.53.LA-QK, 1.IS.53.HN-LF, 1.IS.53.LA-LF, 1.JU.53.GP-LG, 1.KR.53.LA-LF, 1.OA.53.LA-QK, 1.SY.53.LA-QK, 1.YA.35.HA-W1, 1.YA.35.HA-X4, 1.YA.52.HA, 1.YA.52.LA, 1.YA.55.DA-TP, 1.YA.55.LA-TP, 1.YA.56.LA, 1.YB.52.HA, 1.YB.52.LA, 1.YB.55.DA-TP, 1.YB.55.LA-TP, 1.YB.56.LA, 1.YF.35.HA-W1, 1.YF.35.HA-X4, 1.YF.52.HA, 1.YF.55.DA-TP, 1.YF.55.LA-TP, 1.YF.56.LA, 1.YG.52.HA, 1.YG.52.LA, 1.YG.55.DA-TP, 1.YG.55.LA-TP, 1.YG.56.LA, 1.YR.52.HA, 1.YR.52.LA, 1.YR.56.LA, 1.YS.35.HA-W1, 1.YS.35.HA-X4, 1.YS.52.HA, 1.YS.52.LA, 1.YS.55.DA-TP, 1.YS.55.LA-TP, 1.YS.56.LA, 1.YT.35.HA-W1, 1.YT.35.HA-X4, 1.YT.52.HA, 1.YT.52.LA, 1.YT.55.DA-TP, 1.YT.55.LA-TP, 1.YT.56.LA, 1.YU.52.HA, 1.YU.52.LA, 1.YU.55.DA-TP, 1.YU.55.LA-TP, 1.YU.56.LA, 1.YV.35.HA-W1, 1.YV.35.HA-X4, 1.YV.52.HA, 1.YV.52.LA, 1.YV.55.DA-TP, 1.YV.55.LA-TP, 1.YV.56.LA, 1.YW.52.HA, 1.YW.52.LA, 1.YW.55.DA-TP, 1.YW.55.LA-TP, 1.YW.56.LA, 1.YX.52.HA, 1.YX.52.HA-AV, 1.YX.52.LA, 1.YX.56.LA, 1.YZ.35.HA-W1, 1.YZ.35.HA-X4, 1.YZ.52.HA, 1.YZ.52.LA, 1.YZ.55.DA-TP, 1.YZ.55.LA-TP, 1.YZ.56.LA)
- Diabetes: ICD-9-CM codes 250.0, 250.1, 250.2, 250.3, 250.8, 250.9; ICD-10-CA codes E10.1, E10.6, E10.7, E10.9, E11.0, E11.1, E11.6, E11.7, E11.9, E13.0, E13.1, E13.6, E13.7, E13.9, E14.0, E14.1, E14.6, E14.7, E14.9
- Hypoglycemia: ICD-9-CM code 251.2; ICD-10-CA codes E16.0, E16.1, E16.2
- Gastroenteritis: ICD-9-CM code 558.9; ICD-10-CA codes K52.2, K52.8, K52.9
- Kidney/Urinary Infections: ICD-9-CM codes 590, 599.0, 599.9; ICD-10-CA codes N10, N11, n12, N13.6, N15.1, N15.8, N15.9, N16.0-N16.5, N28.83-N28.85, N36.9, N39.0, N39.9
- Dehydration/Volume Depletion: ICD-9-CM code 276.5, ICD-10-CA code E86
- Iron Deficiency Anemia: ICD-9-CM codes 280.1, 280.8, 280.9; ICD-10-CA codes D50.1, D50.8, D50.9 (patients age 0 to 5 only)
- Nutritional Deficiencies: ICD-9-CM codes 260, 261, 262, 268.0, 268.1; ICD-10-CA codes E40-E43, E55.0, E64.3
- Failure to Thrive: ICD-9-CM code 783.4, ICD-10-CA code R62 (patients less than one year of age only)
- Pelvic Inflammatory Disease: ICD-9-CM code 614; ICD-10-CA codes N70, N73, N99.4 (female patients only, patients with a hysterectomy procedure coded are excluded: ICD-9-CM procedure codes 68.3-68.8; CCI codes 1.RM.87, 1.RM.89, 1.RM.91, 5.CA.89.CK, 5.CA.89.DA, 5.CA.89.GB, 5.CA.89.WJ, 5.CA.89.WK)

- Dental Conditions: ICD–9–CM codes 521, 522, 523, 525, 528; ICD–10–CA codes K02–K06, K08, K09.8, K09.9, K12, K13

Human Immunodeficiency Virus (HIV)

The age– and sex–adjusted point prevalence of HIV was calculated as of December 31, 2017. HIV cases were defined as Manitoba residents whom, as of December 31, 2017, had one or more positive laboratory tests for HIV since August 31, 2009. The definition for a positive laboratory test was developed in partnership with Cadham Provincial Laboratory and Manitoba Health, Healthy Living and Seniors. The denominator is all Manitoba residents as of December 31, 2017.

It is important to note that using August 31, 2009 as our start date limits our estimate to those people with positive tests for HIV after this date. Thus, we fail to capture anyone diagnosed before August 31, 2009 who did not have a subsequent positive test within the period of interest. Since most individuals with HIV are regularly tested after their diagnosis to determine viral loads, the number of missed cases is estimated to be small.

Hypertension (High Blood Pressure)

The age– and sex–adjusted incidence and prevalence of hypertension was calculated for residents age 19 and older for fiscal years 2011/12 and 2016/17. Hypertension was defined by one of the following conditions:

- one or more hospitalizations with a diagnosis of hypertension: ICD–9–CM codes 401–405; ICD–10–CA codes I10–I13, I15
- two or more physician visits with a diagnosis of hypertension (ICD–9–CM codes as above)
- two or more prescriptions for medications to treat hypertension (listed below)

For prevalence, the denominator includes all Manitoba residents age 19 and older as of December 31, 2011 and 2016. For incidence, only residents at risk of developing the disease were included in the analysis, and rate of new cases was calculated per 100 person–years at risk. A 1–year wash–out period prior to the start of the study years was used to distinguish between prevalent and incident cases, and residents had to be registered with Manitoba Health for the entire 1–year period to be included in the analysis.

List of included drug Anatomic Therapeutic Chemical (ATC) codes and generic drug names used to treat hypertension:

- C02AB – Methyldopa
- C02AC01 – Clonidine
- C02CA01 – Prazosin
- C02CA04 – Doxazosin
- C02DB02 – Hydralazine
- C02DC01 – Minoxidil
- C02LA01 – Reserpine and Diuretics
- C02LB01 – Methyldopa and Diuretics
- C03AA03 – Hydrochlorothiazide
- C03BA04 – Chlorthalidone
- C03BA08 – Metalozone

- C03BA11 – Indapamide
- C03CA01 – Furosemide
- C03DA01 – Spironolactone
- C03DA04 – Eplerenone
- C03DB01 – Amiloride
- C03EA01 – Hydrochlorothiazide and Potassium Sparing Agents
- C07AA02 – Oxprenolol
- C07AA03 – Pindolol
- C07AA05 – Propranolol
- C07AA06 – Timolol
- C07AA12 – Nadolol
- C07AB02 – Metoprolol
- C07AB03 – Atenolol
- C07AB04 – Acebutalol
- C07AB07 – Bisoprolol
- C07AB12 – Nebivolol
- C07AG01 – Labetalol
- C07BA05 – Propranolol and Thiazide
- C07BA06 – Timolol and Thiazide
- C07CA03 – Pindolol and Thiazide
- C07CB03 – Atenolol and Diuretics
- C08CA01 – Amlodipine
- C08CA02 – Felodipine
- C08CA04 – Nicardipine
- C08CA05 – Nifedipine
- C08CA55 – Nifedipine, Combinations
- C08DA01 – Verapamil
- C08DB01 – Diltiazem
- C09AA – Ace Inhibitors, Plain
- C09BA – Ace Inhibitors and Diuretics
- C09BB – Ace Inhibitors and Calcium Channel Blockers
- C09CA – Angiotensin II Antagonists, Plain
- C09DA – Angiotensin II Antagonists and Diuretics
- C09DB – Angiotensin II Antagonists and Calcium Channel Blockers
- C09XA02 – Aliskiren
- C09XA52 – Aliskiren and Hydrochlorothiazide
- G04CA03 – Terazosin

List of excluded Drug Information Numbers (DINs) for Nifedipine, which is not indicated for hypertension:

- 00756830
- 00557633
- 00692727
- 00755907
- 01946307
- 02155877
- 02235898
- 00692735
- 02047462

- 00613258
- 00725110
- 02155869

This definition usually excludes any drugs that were not administered orally, and those that were used to treat ocular hypertension. However, this exclusion was not applied in this report, as the data for the study period did not include drugs for treatment of ocular hypertension.

Inadequate Prenatal Care

The average annual maternal age-adjusted proportion of singleton live births whose mothers received no or inadequate prenatal care was calculated for two 5-year time periods: 2007/08–2011/12 and 2012/13–2016/17. Mothers with no or inadequate prenatal care were determined as those with a low score on the R-GINDEX (Revised-Graduated Prenatal Care Utilization Index) [3]. The denominator includes all singleton live births in Manitoba hospitals (ICD-10-CA codes Z38.0, Z38.1, Z38.2) where the mother was covered by Manitoba Health for the entire gestation period. Stillbirths and records with gestational age missing, less than 20 weeks, or greater than 45 weeks were excluded.

The ICD-9-CM tariffs used to identify a prenatal care visit were: 8400 and 8401. If a diagnosis of pregnancy was also recorded on the medical claim then ICD-9-CM tariffs 8501, 8507, 8509, 8529, 8540, and 8550 were also used. The ICD-9-CM diagnosis codes used to identify a prenatal care visit were 640-669, V22, V23.

Infant Mortality

The average annual maternal age-adjusted rate of deaths per 1,000 residents age 0 to 364 days was calculated for two 5-year time periods: 2007–2011 and 2012–2016. The denominator includes all live births in Manitoba as of December 31 from 2006–2015, with deaths up to December 31, 2016. The maternal age-adjusted rates were also calculated for 20 calendar years (1997–2016), with a denominator of all live births in Manitoba as of December 31 from 1996–2015 with deaths up to December 31, 2016.

Injury Hospitalization

The age- and sex-adjusted rate of injury hospitalizations per 1,000 residents age 0-19 was calculated for fiscal years 2010/11-2015/16. Injury hospitalizations were defined as any inpatient hospital episode with a diagnosis code for external cause of injury (E-code): ICD-9-CM codes E800-E999, ICD-10-CA codes V01-Y89. Hospital episodes with diagnosis codes for injury related to medical error, drug complications, suicide attempts and self-inflicted injury were excluded:

- misadventures during surgical or medical care: ICD-9-CM codes E870-E876; ICD-10-CA codes Y60-Y69, Y88.1
- reactions or complications due to medical care: ICD-9-CM codes E878-E879; ICD-10-CA codes Y70-Y84, Y88.2, Y88.3
- adverse effects due to drugs: ICD-9-CM codes E930-E949; ICD-10-CA codes Y40-Y59, Y88.0
- suicide attempts: ICD-9-CM codes E950-E959; ICD-10-CA codes X60-X84;
- intentional self-harm: ICD-10-CA codes X60-X84.

Transfers between hospitals were tracked and only hospital episodes were counted, not individual separations, to reduce double-counting. All Manitoba hospitals were included; nursing stations and long-term care facilities (Deer Lodge Centre, Manitoba Adolescent Treatment Centre, Rehabilitation Centre for Children, and Riverview Health Centre) were excluded. Out-of-province hospitalizations for Manitoba residents were also included. Newborn birth injuries or deaths, stillbirths, and brain deaths were also excluded.

Inpatient Hospitalization

The age- and sex-adjusted rate of inpatient hospitalizations per 1,000 residents was calculated for fiscal years 2011/12 and 2016/17. Multiple admissions of the same person were counted as separate events. All Manitoba hospitals were included; personal care homes (PCHs), nursing stations, and long-term care facilities were excluded (Deer Lodge Centre, Manitoba Adolescent Treatment Centre, Rehabilitation Centre for Children, and Riverview Health Centre). Out-of-province hospitalizations for Manitoba residents were also included. In cases of birth, newborn hospitalizations were excluded (the mother's hospitalization was included). The denominator includes all Manitoba residents as of December 31, 2011 and 2016.

Ischemic Heart Disease (IHD)

The age- and sex-adjusted incidence and prevalence of IHD was calculated for residents age 19 and older in two 5-year time periods: 2007/08–2011/12 and 2012/13–2016/17. IHD was defined by one of the following conditions:

- one or more hospitalizations with a diagnosis of IHD, ICD-9-CM codes 410–414; ICD-10-CA codes I20–I22, I24, I25
- two or more physician visits with a diagnosis of IHD (ICD-9-CM codes as above)
- one physician visit with a diagnosis of IHD (ICD-9-CM codes as above) and two or more prescriptions for medications to treat IHD (listed below)

For prevalence, the denominator includes all Manitoba residents age 19 and older as of December 31, 2009 and 2014. For incidence, only residents at risk of developing the disease were included in the analysis, and rate of new cases was calculated per 100 person-years at risk. A 5-year wash-out period prior to the start of the study years was used to distinguish between prevalent and incident cases, and residents had to be registered with Manitoba Health for the entire 5-year period to be included in the analysis.

List of drug Anatomic Therapeutic Chemical (ATC) codes and corresponding generic drug names used to treat IHD:

- B01AC04 – clopidogrel
- B01AC06 – acetylsalicylic acid (81mg)
- B01AC22 – prasugrel
- B01AC24 – ticagrelor
- C01DA02 – glyceryl trinitrate
- C01DA05 – pentaerithrityl tetranitrate
- C01DA08 – isosorbide dinitrate
- C01DA14 – isosorbide mononitrate
- C07AA02 – oxprenolol
- C07AA03 – pindolol
- C07AA05 – propranolol

- C07AA06 – timolol
- C07AA12 – nadolol
- C07AB02 – metoprolol
- C07AB03 – atenolol
- C07AB04 – acebutolol
- C07AB07 – bisoprolol
- C07AB12 – nebivolol
- C07AG01 – labetalol
- C07AG02 – carvedilol
- C07BA05 – propranolol and thiazides
- C07BA06 – timolol and thiazides
- C07CA03 – pindolol and other diuretics
- C07CB03 – atenolol and other diuretics
- C08CA01 – amlodipine
- C08CA02 – felodipine
- C08CA04 – nifedipine
- C08CA05 – nifedipine
- C08CA06 – nimodipine
- C08CA55 – nifedipine, combinations
- C08DA01 – verapamil
- C08DB01 – diltiazem
- C09AA01 – captopril
- C09AA02 – enalapril
- C09AA03 – lisinopril
- C09AA04 – perindopril
- C09AA05 – ramipril
- C09AA06 – quinapril
- C09AA07 – benazepril
- C09AA08 – cilazapril
- C09AA09 – fosinopril
- C09AA10 – trandolapril
- C09BA02 – enalapril and diuretics
- C09BA03 – lisinopril and diuretics
- C09BA04 – perindopril and diuretics
- C09BA05 – ramipril and diuretics
- C09BA06 – quinapril and diuretics
- C09BA08 – cilazapril and diuretics
- C09BB04 – perindopril and amlodipine
- C09BB05 – ramipril and felodipine
- C09BB10 – trandolapril and verapamil
- C09CA01 – losartan
- C09CA02 – eprosartan
- C09CA03 – valsartan
- C09CA04 – irbesartan
- C09CA06 – candesartan
- C09CA07 – telmisartan
- C09CA08 – olmesartan
- C09DA01 – losartan and diuretics

- C09DA02 – eprosartan and diuretics
- C09DA03 – valsartan and diuretics
- C09DA04 – irbesartan and diuretics
- C09DA06 – candesartan and diuretics
- C09DA07 – telmisartan and diuretics
- C09DA08 – olmesartan and diuretics
- C09DB04 – telmisartan and amlodipine
- C09DX04 – valsartan and sacubitril
- C10AA01 – simvastatin
- C10AA02 – lovastatin
- C10AA03 – pravastatin
- C10AA04 – fluvastatin
- C10AA05 – atorvastatin
- C10AA06 – cerivastatin
- C10AA07 – rosuvastatin
- C10AB02 – bezafibrate
- C10AB04 – gemfibrozil
- C10AB05 – fenofibrate
- C10AC01 – colestyramine
- C10AC02 – colestipol
- C10AX09 – ezetimibe
- C10AX13 – evolocumab
- C10AX14 – alirocumab
- C10BA01 – lovastatin and nicotinic acid
- C10BX03 – atorvastatin and amlodipine
- N02BA01 – acetylsalicylic acid (tablet strength \leq 325 mg)

Knee Replacement

The average annual age- and sex-adjusted rate of knee replacement surgeries per 1,000 residents age 40 and older was calculated for two 5-year time periods: 2007/08–2011/12 and 2012/13–2016/17. Knee replacement surgeries were defined by hospitalizations with ICD–9–CM procedure codes 81.54 and 81.55 and CCI codes 1.VG.53.LA–PN and 1.VG.53.LA–PP. To reduce double-counting, only interventions that were not marked Out of Hospital, or OOH, were included. The denominator includes all Manitoba residents age 40 and older as of December 31 of each year (2007–2016).

Large for Gestational Age

The maternal age-adjusted rate of large for gestational age (LGA) births was calculated for fiscal years 2007/08–2011/12 and 2012/13–2016/17. The LGA rate is expressed as the proportion of LGA live births out of all live births in Manitoba hospitals (ICD–10–CA code Z37.0, Z37.2, Z37.3, Z37.5). Records with gestational age missing, less than 20 weeks, or greater than 45 weeks or birth weight missing, less than 200g or greater than 8kg were excluded.

Level of Care on Admission to Personal Care Home (PCH)

The distribution of levels of care assigned to personal care home (PCH) residents 75 years and older at the time of their admission to a provincial PCH for fiscal years 2010/11–2011/12 and 2015/16–2016/17. Level

1 represents the lowest level of need, and Level 4 represents the highest. For the study years there were zero residents admitted at level of care 1. Levels 2 and 3 are stratified by the close supervision indicator (coded as yes/no on assessment to indicate the need for close supervision due to possible behavioural issues), but due to small numbers level 4 was not stratified. The denominator includes all Manitoba residents 75 and older as of December 31 of each year. Region assignment in the numerator was based on postal code and municipal code prior to admission. This indicator only includes information on provincial PCH beds; federal beds are not included due to lack of information in the provincial data. Misericordia and Churchill Hospital Long Term Care patients are included in the analysis.

Life Expectancy at Birth

The expected length of life from birth was calculated based on the patterns of mortality in the population from the preceding five years. Data were analyzed for 20 calendar years (1997–2016) and two 5-year time periods, 2007–2011 and 2012–2016. Values were not age-adjusted but calculated directly from the mortality experience of local residents using a “life table” approach. Small differences in life expectancy values imply important differences in health status.

Location of Visits to Family Physicians and Nurse Practitioners

Information regarding where Regional Health Authority (RHA) residents went for ambulatory visits to family physicians and nurse practitioners by the following categories: (1) percent of visits in patient’s RHA district, (2) percent of visits elsewhere in patient’s RHA, (3) percent of visits to another RHA, and (4) percent of visits to Winnipeg. A physician’s location is assigned based on where the majority of their patients reside. The location of ambulatory visits was calculated for fiscal years 2011/12 and 2016/17. Only ambulatory visits to family physicians and nurse practitioners were counted, defined by mdblocs 11 and 200. Only visits for Manitoba residents within Manitoba were counted. MD number –001 was assigned to out of province physicians and was therefore excluded. This may result in some possible under-counting of visits to RHA districts that border other provinces.

Lower Limb Amputations Among Residents with Diabetes

The age- and sex-adjusted percent of residents with diabetes age 19 and older who had a lower limb amputation (below or including the knee) was calculated for two 5-year time periods: 2007/08–2011/12 and 2012/13–2016/17. Diabetes was defined in the three fiscal year period at the start of each study period: 2007/08–2009/10 and 2012/13–2014/15. Amputation was defined by a hospitalization with a surgery for a lower limb amputation, identified by ICD–9–CM procedure codes 84.10–84.17 and CCI codes 1.VC.93, 1.VG.93, 1.VQ.93, 1.WA.93, 1.WE.93, 1.WJ.93, 1.WK.93, 1.WL.93, and 1.WM.93, 1.WN.93. This definition includes all amputations for those with diabetes excluding only those amputations due to accidental injury (defined by ICD–9–CM diagnosis codes 878, 885, 886, 895, 896, 897 and ICD–10–CA codes: S08, S18, S28.1, S38.2, S38.3, S48, S58, S68, S78, S88, S98, T05, T11.6, T13.6, T14.7).

Magnetic Resonance Imaging (MRI) Scans

The age- and sex-adjusted rate of MRIs per 1,000 residents age 20 and older was calculated for fiscal years 2011/12 and 2016/17. MRIs were defined by a physician claim with physician tariff codes 7501–7528. To count person-visits, only one scan per day is counted, as there could be multiple body parts scanned

each with their own claim. The denominator includes all Manitoba residents age 20 and older as of December 31, 2011 and 2016.

Length of Stay in Personal Care Home (PCH) by Level of Care on Admission

The minimum length of time (in years) which 50% of all PCH residents age 75 years and older spent in PCH before leaving the facility, according to their level of care on admission; so half of PCH residents spent less than this amount of time, and half spent longer. Level 1 represents the lowest level of need, and Level 4 represents the highest. Levels 2 and 3 are stratified into residents whose assessment indicated a need for close supervision due to possible behavioural issues ("2Y" or "3Y") and those who did not ("2N" or "3N").

Area of residence was assigned based on where people lived prior to admission (postal code and municipal code). Median values were calculated for two 2-year periods: 2010/11–2011/12 and 2015/16–2016/17, and were adjusted for age, sex, RHA, and time period.

Waiting Time for Personal Care Home (PCH) Admission

The wait time (in weeks) for 50% of personal care home (PCH) residents (75 years and older) for admission to a PCH after being assessed as requiring PCH placement in fiscal years 2010/11–2011/12 and 2015/16–2016/17. Adjusted medians were estimated in quantile regression models, controlling for age, sex, Regional Health Authority (RHA) (or zone/Winnipeg CA, or district/Winnipeg NC), and time period, and separate models were run for residents assessed for PCH placement while in hospital versus residing in the community. For example, in the two year period 2015/16–2016/17, the adjusted median for residents assessed in hospital was 2.53 weeks, so half of these PCH residents waited less than 2.53 weeks from assessment to placement, while half waited longer. This indicator only includes information on provincial PCH beds; federal beds are not included due to lack of information in the provincial data. Misericordia and Churchill Hospital Long Term Care patients are included in the analysis.

Mood and Anxiety Disorders

The age- and sex-adjusted prevalence of mood and anxiety disorders was calculated for Manitoba residents in four 5-year time periods: 1997/98–2001/02 to 2012/13–2016/17. Mood and anxiety disorders were defined by one of the following conditions:

- one or more hospitalizations with a diagnosis of depression, episodic mood disorders (i.e., bipolar disorder, manic episode), or anxiety (i.e., anxiety disorders, phobic disorders, obsessive-compulsive disorders): ICD-9-CM codes 296.1–296.8, 300.0, 300.2–300.4, 300.7, 309, 311; ICD-10-CA codes F31, F32, F33, F34.1, F38.0, F38.1, F40, F41.0–F41.3, F41.8, F41.9, F42, F43.1, F43.2, F43.8, F45.2, F53.0, F93.0
- one or more physician visits with a diagnosis of depression or episodic mood disorders: ICD-9-CM codes 296 and 311.
- one or more hospitalizations or physician visits with a diagnosis of anxiety, dissociative, and somatoform disorders: ICD-9-CM code 300; ICD-10-CA codes F32, F34.1, F40, F41, F42, F44, F45.0, F45.1, F48, F68.0, F99 and one or more prescriptions for an antidepressant (i.e., fluoxetine, citalopram, desipramine, venlafaxine), benzodiazepine derivatives anxiolytics (i.e., diazepam), or lithium (an antipsychotic): ATC codes N05AN01, N05BA, N06A

- three or more physician visits with a diagnosis of anxiety, dissociative, and somatoform disorders or adjustment reaction, ICD–9–CM codes 300 and 309

The denominator includes all Manitoba residents as of December 31, 1999, 2004, 2009, and 2014.

Osteoporosis

The age– and sex–adjusted prevalence of osteoporosis was calculated for residents age 50 and older in two fiscal years 2011/12 and 2016/17. Osteoporosis was defined by one of the following conditions:

- one or more hospitalizations with a diagnosis of osteoporosis: ICD–9–CM code 733.0, ICD–10–CA code M81.
- one or more physician visits with a diagnosis of osteoporosis: ICD–9–CM code 733.
- one or more prescriptions for medications to treat osteoporosis (listed below)

The denominator includes all Manitoba residents age 50 and older as of December 31, 2011 and 2016.

List of Drug Identification Numbers (DINs) and generic drug names used to treat osteoporosis:

- 2308398 – Alendronic Acid (Alendronate Sodium)
- 2385023 – Alendronic Acid (Alendronate Sodium)
- 2343924 – Alendronic Acid (Alendronate Sodium Trihydrate)
- 2454467 – Alendronic Acid (Alendronate Sodium) / Vitamin D3 (Cholecalciferol)
- 2454475 – Alendronic Acid (Alendronate Sodium)/Vitamin D3 (Cholecalciferol)
- 2405717 – Alendronic Acid (Alendronate Sodium Trihydrate) / Vitamin D3 (Cholecalciferol)
- 2405725 – Alendronic Acid (Alendronate Sodium Trihydrate) / Vitamin D3 (Cholecalciferol)
- 2347989 – Calcium (Calcium Carbonate) / Etidronate Disodium
- 2358697 – Calcium (Calcium Carbonate) / Etidronate Disodium
- 2442760 – Risedronate Sodium (Risedronate Sodium Hemi–Pentahydrate)
- 2370239 – Risedronate Sodium (Risedronate Sodium Monohydrate)
- 2406284 – Risedronate Sodium (Risedronate Sodium Hemi–Pentahydrate)
- 2427354 – Risedronate Sodium (Risedronate Sodium Hemi–Pentahydrate)
- 2309874 – Risedronate Sodium (Risedronate Sodium Hemi–Pentahydrate)
- 2358883 – Risedronate Sodium (Risedronate Sodium Monohydrate)
- 2358905 – Risedronate Sodium (Risedronate Sodium Monohydrate)
- 2377446 – Risedronate Sodium (Risedronate Sodium Hemi–Pentahydrate)
- 2362414 – Risedronate Sodium (Risedronate Sodium Hemi–Pentahydrate)
- 2285541 – Risedronate Sodium / Calcium (Calcium Carbonate)
- 2408449 – Zoledronic Acid (Zoledronic Acid Monohydrate)
- 2421720 – Zoledronic Acid (Zoledronic Acid Monohydrate)
- 2343568 – Denosumab
- 2201011 – Alendronate Sodium
- 2245329 – Alendronate Sodium
- 2247373 – Alendronate Sodium
- 2248625 – Alendronate Sodium Trihydrate
- 2248728 – Alendronate Sodium
- 2248730 – Alendronate Sodium
- 2258110 – Alendronate Sodium Trihydrate
- 2261715 – Alendronate Sodium
- 2270129 – Alendronate Sodium

- 2270889 – Alendronate Sodium Trihydrate
- 2273179 – Alendronate Sodium
- 2275279 – Alendronate Sodium
- 2282763 – Alendronate Sodium
- 2282771 – Alendronate Sodium
- 2284006 – Alendronate Sodium
- 2286335 – Alendronate Sodium
- 2288087 – Alendronate Sodium
- 2288109 – Alendronate Sodium
- 2299712 – Alendronate Sodium
- 2302004 – Alendronate Sodium
- 2303078 – Alendronate Sodium
- 2352966 – Alendronic Acid
- 2372304 – Alendronate Sodium Trihydrate
- 2381486 – Alendronate Sodium
- 2381494 – Alendronate Sodium
- 2384701 – Alendronate Sodium
- 2384728 – Alendronate Sodium
- 2385031 – Alendronate Sodium
- 2388545 – Alendronate Sodium
- 2388553 – Alendronate Sodium
- 2394863 – Alendronate Sodium
- 2394871 – Alendronate Sodium
- 2401126 – Alendronate Sodium
- 2401134 – Alendronate Sodium
- 2428725 – Alendronate Sodium
- 2428733 – Alendronate Sodium
- 2276429 – Alendronate Sodium & Vitamin D3
- 2314940 – Alendronate Acid & Vitamin D3
- 2403633 – Alendronic Acid & Vitamin D3
- 2403641 – Alendronic Acid & Vitamin D3
- 2429160 – Alendronate Acid & Vitamin D3
- 2240775 – Calcitonin
- 2247585 – Calcitonin
- 2261766 – Calcitonin
- 2311046 – Calcitonin
- 2343541 – Denosumba
- 2176017 – Etidronate Disodium & Calcium Carbonate
- 2247323 – Etidronate Disodium & Calcium Carbonate
- 2263866 – Etidronate Disodium & Calcium Carbonate
- 2324199 – Etidronate Disodium & Calcium Carbonate
- 2353210 – Etidronate Disodium & Calcium
- 2239028 – Raloxifene Hydrochloride
- 2279215 – Raloxifene Hydrochloride
- 2312298 – Raloxifene Hydrochloride
- 2358840 – Raloxifene Hydrochloride
- 2358921 – Raloxifene Hydrochloride
- 2415852 – Raloxifene Hydrochloride

- 2242518 – Risedronate Sodium
- 2246896 – Risedronate Sodium
- 2297787 – Risedronate Sodium
- 2298376 – Risedronate Sodium
- 2298392 – Risedronate Sodium
- 2302209 – Risedronate Sodium
- 2309831 – Risedronate Sodium
- 2316838 – Risedronate Sodium
- 2319861 – Risedronate Sodium
- 2327295 – Risedronate Sodium
- 2341077 – Risedronate Sodium
- 2347474 – Risedronate Sodium
- 2352141 – Risedronate Sodium
- 2353687 – Risedronate Sodium
- 2357984 – Risedronate Sodium
- 2368552 – Risedronate Sodium
- 2370255 – Risedronate Sodium
- 2370417 – Risedronate Sodium
- 2377721 – Risedronate Sodium
- 2397773 – Risedronate Sodium
- 2406306 – Risedronate Sodium
- 2411407 – Risedronate Sodium
- 2413809 – Risedronate Sodium
- 2424177 – Risedronate Sodium
- 2279657 – Risedronate Sodium & Calcium
- 2254689 – Teriparatide
- 2269198 – Zoledronic Acid
- 2408082 – Zoledronic Acid
- 2415100 – Zoledronic Acid
- 2422433 – Zoledronic Acid
- 2303043 – Alendronate Sodium

Percutaneous Coronary Interventions (PCI) (Angioplasty with or without Stent Insertion)

The average annual age- and sex-adjusted rate of PCIs per 1,000 residents age 40 and older was calculated for two 5-year time periods: 2007/08–2011/12 and 2012/13–2016/17. PCIs were defined by hospitalizations with CCI codes 1.IJ.50 and 1.IJ.57. The denominator includes all Manitoba residents age 40 and older as of December 31 of each year (2007–2016). PCIs were only performed at the two tertiary hospitals (Health Sciences Centre and St. Boniface General Hospital), so only hospitalizations from those two hospitals were included in the analysis in order to eliminate the potential for double-counting of interventions. To further reduce double-counting, only interventions that were not marked Out of Hospital, or OOH, were included.

Population Pyramids

The percent (or actual number) of residents within each five-year age group (from age 0 to 90+ years) is shown for both males (on the left side of the graph) and females (on the right side). In this report, there are two types of population pyramids shown for each RHA:

- a. The first pyramid is a comparison of one RHA to the Manitoba population on December 31, 2016, showing the percentage of males and females in each five-year age category. For each RHA and for Manitoba, the male plus female bars add up to 100%.
- b. The second pyramid shows how each RHA has changed over time. The RHA population on December 31, 2011 is compared with that on December 31, 2016, showing the actual number of males and females in each five-year age category (males on the left, females on the right). The numbers in each of the bars add up to the total population for that RHA in each year.

Post-Acute Myocardial Infarction (AMI) Care: Beta-Blocker Dispensations

The crude (unadjusted) percent of residents age 20 and older hospitalized for an AMI who then filled at least one prescription for a beta-blocker within four months of hospital discharge was calculated for two 5-year time periods: 2007/08–2011/12 and 2012/13–2016/17. AMI patients were identified by a hospitalization with a diagnosis of AMI (ICD–9–CM code 410 or ICD–10–CA code I21). Beta-blocker medications were defined by ATC codes C07AA and C07AB. To be included in the analysis, patients had to be alive for the entire follow-up period. Patients with a previous hospitalization for an Acute Myocardial Infarction (AMI) in the three years prior to the index AMI hospitalization were excluded from analyses. Patients with the following diagnoses in hospital in the three years prior to the index event were also excluded from analyses because beta-blockers are contra-indicated for patients with these conditions:

- Asthma: ICD–9–CM code 493, ICD–10–CA code J45
- Chronic obstructive pulmonary disease: ICD–9–CM codes 491 and 492, ICD–10–CA codes J41–J44
- Peripheral vascular disease: ICD–9–CM codes 443 and 459, ICD–10–CA codes I73, I79.2, I87

Potential Years of Life Lost (PYLL)

The age- and sex-adjusted average annual number of years between age at death and age of 75 for the population 1 to 74 years of age was calculated for calendar years 2007–2011 and 2012–2016. For each death, the PYLL value is calculated as: $PYLL = 75 - \text{age at death}$. The denominator includes all Manitoba residents 1 to 74 years as of December 31 of each year (2007–2016).

Potentially Avoidable Death

The average annual age- and sex-adjusted rate of potentially avoidable deaths per 1,000 residents 0 to 74 years of age was calculated for two 5-year time periods: 2007–2011 and 2012–2016. Potentially avoidable deaths were defined based on a methodology developed by the Canadian Institute for Health Information [4], with two modifications:

1. Complications of perinatal period: ICD–10–CA 'H31.1–Choroidal degeneration' was removed on suggestion from CIHI as it was included in the list in error.
2. Injuries of undetermined intent: ICD–10–CA 'Y87.2–Late effects of injury of undetermined intent' was included to keep this definition consistent with our suicide definition.

The conditions were separated into three categories:

1. 50% Treatable and 50% Preventable
2. Preventable

3. Treatable

The denominator includes all Manitoba residents 0 to 74 years as of December 31 of each year (2007–2016).

Premature Mortality Rate (PMR)

The average annual age- and sex-adjusted rate of premature deaths per 1,000 residents 0 to 74 years of age was calculated for 10 calendar years (2007–2016), 20 calendar years (1997–2016), as well as for two 5-year time periods: 2007–2011 and 2012–2016. The 10-year rates were used to determine the ordering of regions in all graphs in the report. The denominator includes all Manitoba residents 0 to 74 years as of December 31 of each relevant year (1997–2016).

Preterm Birth

The maternal age-adjusted rate of preterm births was calculated for fiscal years 2007/08–2011/12 and 2012/13–2016/17. The preterm birth rate is expressed as the proportion of live in-hospital births with a gestational age of less than 37 completed weeks out of all live births in Manitoba hospitals (ICD–10–CA code Z38). Records with gestational age missing, less than 20 weeks, or greater than 45 weeks were excluded.

Residents in Personal Care Homes (PCH)

The age- and sex-adjusted average annual percent of residents 75 years and older who were in a personal care home (PCH) for at least one day in the fiscal year was calculated for two 2-year time periods: 2010/11–2011/12 and 2015/16–2016/17. The denominator includes all Manitoba residents 75 years and older as of December 31 of each year. Misericordia and Churchill Hospital Long Term Care patients are included in the analysis. Region assignment in the numerator was based on current postal code and municipal code, which was determined by the location of the PCH.

Small for Gestational Age (SGA) Birth

The maternal age-adjusted rate of small for gestational age (SGA) births was calculated for fiscal years 2007/08–2011/12 and 2012/13–2016/17. The SGA rate is expressed as the proportion of SGA live births out of all live births in Manitoba hospitals (ICD–10–CA code Z37.0, Z37.2, Z37.3, Z37.5). Records with gestational age missing, less than 20 weeks, or greater than 45 weeks or birth weight missing, less than 200g or greater than 8kg were excluded.

Social and Material Deprivation Indices

Factor scores based on Canadian Census data, including the proportion of the population age 15 and older that are separated, divorced, or widowed; proportion of the population that lives alone; and proportion of the population that has moved in the past five years. Indicator variables included in material deprivation are: average household income, unemployment rate for those age 15 and older, and proportion of population age 15 and older without high school graduation [5].

Social and material deprivation indices were calculated for Census years 2011 and 2016 at the geographic level of Dissemination Area (DA). DAs are the smallest standard geographic unit for which Census data are

collected and typically have a population of 400 to 700 people. DAs with missing values for any indicator variable had values imputed from corresponding Census subdivisions, a larger census geographic unit. First Nations communities with missing values had the weighted means from Northern or Southern First Nations communities applied. Population-weighted mean scores and 95% confidence intervals (CIs) were calculated for larger geographical regions (Regional Health Authorities (RHA), Winnipeg Community Area, etc.) and comparisons to the Manitoba average for each index were calculated via weighted t-tests. Values above zero indicate more deprivation and values below zero represent less deprivation, so negative values represent “good” results. Social and material deprivation indices were also calculated for the 20 calendar years 1997–2016 and Census years 1996, 2001, 2006, 2011, and 2016 at the geographic level of Dissemination Area (DA).

Socioeconomic Factor Index (SEFI)

A factor score based on Canadian Census data, including average household income, proportion of single parent households, unemployment rate for those age 15 and older, and proportion of population age 15 and older without high school graduation. SEFI scores range from approximately –5 to +5, and a value of zero represents the Manitoba average with 95% of scores falling within ± 2 points. Scores less than zero indicate more favourable socioeconomic conditions, while scores greater than zero indicate less ideal socioeconomic conditions [5].

SEFI scores were calculated for Census years 2011 and 2016 in a factor analysis at the geographic level of dissemination area (DA), the smallest standard geographic unit for which all Census data are collected and typically have a population of 400 to 700 people. DAs with missing values for any indicator variable had values imputed from corresponding Census subdivisions, a larger census geographic unit. First Nations communities with missing values had the weighted means from Northern or Southern First Nations communities applied. Population-weighted mean SEFI scores and 95% CIs were calculated for larger geographical regions (Regional Health Authorities (RHA), Winnipeg Community Area, etc.) and comparisons to the Manitoba average SEFI and within region between Census years were calculated via weighted t-tests. Values above zero indicate more deprivation, and values below zero represent less deprivation, so negative values represent “good” results.

Stroke

The average annual age- and sex-adjusted rate of hospitalization or death due to stroke per 1,000 residents age 40 and older was calculated for two 5-year time periods: 2007–2011 and 2012–2016. Strokes were defined by one of the following conditions:

- an inpatient hospitalization with the most responsible diagnosis of stroke and a length of stay of one or more days (unless the patient died in hospital)
- a death with stroke listed as the primary cause of death on the Vital Statistics death record

Diagnosis codes used to identify strokes include ICD–9–CM codes 431, 434, 436 and ICD–10–CA codes I61, I63, I64. Transfers between hospitals were tracked and only hospital episodes were counted, not individual hospitalizations, to reduce double-counting. The denominator includes all Manitoba residents age 40 and older as of December 31 of each year (2007–2016).

Suicide

The average annual age- and sex-adjusted rate of suicides per 1,000 residents age 10 and older was calculated for two 5-year time periods: 2007–2011 and 2012–2016. Suicides were defined as any death record in Vital Statistics Registry with any of the following causes:

- Intentional self-harm: ICD-10-CA codes X60–X84
- Late effects of intentional self-harm: ICD-10-CA code Y87.0
- Poisoning of undetermined intent: ICD-10-CA codes Y10–Y19
- Other events of undetermined intent: ICD-10-CA codes Y20–Y34
- Late effects of other events of undetermined intent: ICD-10-CA codes Y87.2.

Events of undetermined intent were included for the purposes of developing a more “inclusive” definition in an attempt to overcome suspected under-counting of suicides in administrative data; however accidental poisonings were not included in the counts of suicide deaths as the uncertainty around the cause of death was too high. The denominator includes all Manitoba residents age 10 and older as of December 31 of each year (2007–2016).

Teen Birth

The average annual age-adjusted teen birth rate per 1,000 women age 15 to 19 was calculated for fiscal years 2007/08–2011/12 and 2012/13–2016/17. Births were defined as live births in Manitoba hospitals with ICD-10-CA codes Z37.0, Z37.2, Z37.3, Z37.5. The denominator includes all Manitoba female residents age 15 to 19 years as of December 31, 2007–2016.

Teen Pregnancy

The average annual age-adjusted teen pregnancy rate per 1,000 women age 15 to 19 was calculated for fiscal years 2007/08–2011/12 and 2012/13–2016/17. This could include live births, still births, ectopic pregnancies, abortions and miscarriages, and was defined by a hospitalization in Manitoba with ICD-10-CA codes: Z37, O00, O02.1, O03, O04, O05, O07, O08, O36.4 or CCI codes: 5.CA.xx, 5.MD.5, 5.MD.60. The denominator includes all Manitoba female residents age 15 to 19 years as of December 31, 2007–2016. Abortions performed in private clinics are not included in the count of teen pregnancies.

Total Mortality Rate

The average annual age- and sex-adjusted rate of deaths per 1,000 residents was calculated for two 5-year time periods: 2007–2011 and 2012–2016. The denominator includes all Manitoba residents as of December 31 of each year (2007–2016).

Total Respiratory Morbidity (TRM)

The age- and sex-adjusted prevalence of TRM was calculated for all residents for fiscal years 2011/12 and 2016/17. TRM was defined by one of the following conditions:

- one or more hospitalizations with a diagnosis of asthma, chronic or acute bronchitis, emphysema, or chronic airway obstruction, ICD–9–CM codes 466, 490, 491, 492, 493, or 496; ICD–10–CA codes J20, J21, J40–J45
- one or more physician visits with a diagnosis of asthma, chronic or acute bronchitis, emphysema, or chronic airway obstruction (ICD–9–CM codes as above)

The denominator includes all Manitoba residents as of December 31, 2011 and 2016.

Travelling to Give Birth

Information regarding where women went to give birth by the following categories: (1) percent delivered at their expected maternity hospital, (2) percent delivered at a maternity hospital in other RHA, (3) percent delivered in a Winnipeg maternity hospital, and (4) percent delivered in a non–maternity hospital. The location of deliveries was calculated for fiscal years 2010/11–2011/12 and 2015/16–2016/17. Includes live births and stillbirths in Manitoba hospitals (ICD–10–CA codes Z37).

Unintentional Injury Causing Death

The average annual age– and sex–adjusted rate of unintentional injuries causing death per 1,000 residents was calculated for two 5–year time periods: 2007–2011 and 2012–2016. Unintentional injuries causing death were defined as any death record in Vital Statistics Registry with an ICD–10–CA injury code (V01–Y98) excluding those ICD–10–CA codes related to suicide (i.e. intentional injury causing death):

- Intentional self–harm: ICD–10–CA codes X60–X84,
- Late effects of intentional self–harm: ICD–10–CA code Y87.0,
- Poisoning of undetermined intent: ICD–10–CA codes Y10–Y19,
- Other events of undetermined intent: ICD–10–CA codes Y20–Y34, or
- Late effects of other events of undetermined intent: ICD–10–CA codes Y87.2.

The denominator includes all Manitoba residents as of December 31 of each year (2007–2016).

Use of Hospitals

The age– and sex–adjusted percent of residents who were admitted to an acute care hospital as an inpatient at least once in a fiscal year was calculated for fiscal years 2011/12 and 2016/17. All Manitoba hospitals were included; personal care homes (PCHs), nursing stations, and long–term care facilities were excluded (Deer Lodge Centre, Manitoba Adolescent Treatment Centre, Rehabilitation Centre for Children, and Riverview Health Centre). Out–of–province hospitalizations for Manitoba residents were also included. In cases of birth, newborn hospitalizations were excluded (the mother’s hospitalization was included). The denominator includes all Manitoba residents as of December 31, 2011 and 2016.

Use of Physicians and Nurse Practitioners

The age– and sex–adjusted percent of residents who received at least one ambulatory visit in a fiscal year was calculated for fiscal years 2011/12 and 2016/17. Ambulatory visits include virtually all contacts with healthcare providers (family physicians, specialists, and nurse practitioners), except during inpatient hospitalization and emergency department visits. The denominator includes all Manitoba residents as of December 31, 2011 and 2016.

Vaginal Birth after Caesarean Section Rate

The maternal age-adjusted rate of vaginal births after caesarean section (C-section) was calculated for fiscal years 2007/08–2011/12 and 2012/13–2016/17. Vaginal births after C-section were defined as:

- a hospitalization with a diagnosis of vaginal birth (ICD-10-CA code Z37) in the absence of a C-section (CCI code 5.MD.60) and with a previous hospitalization for a C-section (ICD-10-CA O34.20 or ICD-9-CM procedure codes 74.0, 74.1, 74.2, 74.4, 74.9 or CCI code 5.MD.60)
- a hospitalization for vaginal birth after C-section (ICD-10-CA code O75.7).

The denominator includes all women who ever had a previous C-section delivery and had a subsequent delivery during the 5 year period in Manitoba hospitals. Includes live births and stillbirths in Manitoba hospitals (ICD-10-CA codes Z37). If women have more than one delivery, one is randomly chosen to only count women once per time period.

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