# Methodology

**Chronic Disease Health Indicators**

Data from the Montana Hospital Discharge Data System (MHDDS), the Office of Vital Statistics (OVS), the Montana Central Tumor Registry (MCTR), and the Montana WIC Management Information System (MIS) at the Montana Department of Public Health and Human Services (DPHHS) were used for the chronic disease indicators within the county profiles.

Mortality, Hospitalization, and Emergency Department Visit Data

Mortality data from death certificates reported to the OVS during the years 2011–2013 for Montana residents were included in the analyses. The National Center for Health Statisitics' matrix was used to classify injury related ICD10 codes. The ICD10 codes can be found at http://www.who.int/classification/icd/en.

The Montana Hospital Association provided access to emergency department visit and inpatient hospitalization data in the MHDDS, which is based on the 2004 Uniform Billing form, with ICD-9 CM coded primary and secondary diagnoses. The ICD9-CM codes can be found at http://www.cms.gov/medicare-coverage-database/staticpages/icd-9-code-lookup.aspx. Only persons hospitalized or visiting an emergency department recorded as residents of Montana during 2011–2013 were included in the analyses. Several important limitations exist with the MHDDS data. First, reporting to the MHDDS is not mandatory, which might result in an under-estimate of the true incidence of hospitalizations and emergency department visits. MHDDS data cannot be deduplicated, and therefore the data might include multiple instances of the same health event, such as multiple hospitalizations for the same injury. Finally, analyses were not restricted to discharge status. Therefore, some health events contribute to multiple rates. For example, an injury leading to an emergency department visit, hospitalization, and eventually to death would be included in all three rates.

Deaths, hospitalizations, and emergency department visits were classified into types based on the ICD10 (deaths) and ICD9-CM (hospitalization, emergency department visits) coded primary and secondary causes (deaths) and diagnoses (hospitalizations, emergency department visits). The following table lists the definitions used for each indicator.

| Health Indicator | Primary and/or Secondary | Deaths (ICD10) | Hospitalizations and ED visits (ICD9-CM) |
|---|---|---|---|
| Asthma | Primary | | 493 |
| Diabetes | Primary or Secondary | | 250.0 – 250.3 |
| Type 1 | Primary or Secondary | | 250.1, 250.3 |
| Type 2 | Primary or Secondary | | 250.0, 250.2 |
| Cardiovascular Disease | Primary | | 391, 402, 404, 410, 420 – 438 |
| With | Secondary | | CVD with secondary 401, 405 |

| | | | |
|---|---|---|---|
| Hypertension | | | |
| COPD | Primary or Secondary | | 490, 491, 492, 494, 496 |
| Injury | Primary | V01-Y36, Y85-Y87, Y89, *U01-*U03 | 800-909.2, 909.4, 909.9, 910-994.9, 995.5-995.59, 995.80-995.85, E800-E869, E880-E929, E950-E999 |
| Unintentional | Primary | Injury with V01-X59, Y85, Y86 | Injury with E800-E869, E880-E929 |
| Falls | Primary | Unintentional injury with W00-W19 | Unintentional injury with E880-E886, E888, E957, E968.1, E987 |
| Motor Vehicle Traffic | Primary | Unintentional injury with V02-V04(.1,.9), V09.2, V12-V14(.3-.9), V19(.4-.6), V20-V28(.3-.9), V29(.4-.9), V30-V79(.4-.9), V81.1, V82.1, V80(.3-.5), V83-V86(.0-.3) V87(.0-.8), V89.2 | Unintentional injury with E810-E819 |
| Poisoning | Primary | Unintentional injury with X40-X49, X60-X64, X85, Y10-Y14 | Unintentional injury with E850-E869, E950-E952, E962, E972, E980-E982 |
| Struck by/against | Primary | Not estimated | Unintentional injury with E916, E917 |
| Unintentional Traumatic Brain Injury | Primary | Not estimated | Unintentional injury with 800.0-801.9, 803.0-804.9, 850.0-851.1, 950.1-950.3, 959.01, 995.55 |
| Suicide/Self-harm | Primary | Injury with X60-X84, Y87.0, *U03 | Injury with E950-E959 |

Cancer Incidence Data

Cancer incidence data were obtained from the Montana Central Tumor Registry. Analysis was limited to Montana residents diagnosed with cancer for the years 2011–2013. County level estimates were defined as county of residence at the time of diagnosis. All cancers included all malignant cases and in-situ bladder. Cancer site groups were defined using ICD-O-3 site and histology codes as shown below.

| Cancer Site | ICD-O-3 site | ICD-O-3 histology |
|---|---|---|
| Prostate | C619 | Excluding 9050-9055, 9140, 9590-9992 |
| Lung and bronchus | C340-C349 | Excluding 9050-9055, 9140, 9590-9992 |
| Breast | C500-C509 | Excluding 9050-9055, 9140, 9590-9992 |
| Colon & Rectum | C180-C189, C199, C209, C260 | Excluding 9050-9055, 9140, 9590-9992 |
| Corpus Uteri | C540-C549, C559 | Excluding 9050-9055, 9140, 9590-9992 |
| Melanoma | C440-C449 | 8720-8790 |

WIC Participation Data

WIC participant data were obtained from the Montana WIC Management Information System (MIS), Montana Successful Partners in Reaching Innovative Technology (M-SPIRIT) for the years 2011–2013. Data collected included "ever breastfed" (indicating initiation) among pregnant women and weight and height measurements of children ages 2 through 4 years old. Weight and height measurements were calculated into a Body Mass Index number and categorized as underweight, normal, overweight or obese according to standards established by the Centers for Disease Control and Prevention.

## Analyses

Data were aggregated to the county level using the county of residence. Separate analyses by American Indian reservation were not completed because residence on a reservation was not available in the data sources. Further aggregation of counties to clusters of similar-sized counties was conducted both to provide counties with a comparison to similar counties and in some instances to provide an approximate estimate for smaller counties for which there were not enough events to calculate a stable rate. These clusters were classified as frontier (<5,000), small (5,000–<10,000), medium (10,000–<40,000), and large (≥40,000) counties according to the 2013 U.S. Census population estimates for Montana counties. In addition to comparison to similar-sized counties, the state rate is provided for each indicator.

Chronic Disease Indicator Analyses

Counts were reported when the number of events was five or greater to protect confidentiality. Rates were reported only when the number of events was twenty or greater because of the instability of rates when the number of events is below twenty. Rates were estimated using the county population denominator from each year's mid-year population estimate provided by OVS. Rates are reported as the number of events per 100,000 persons per year.

Because of the varying age distributions between counties, age-adjusted rates were estimated. To age-adjust rates, age-specific rates were applied to a standardized age distribution, eliminating differences in observed rates resulting from age differences in population composition. Age adjustment is a relative index rather than an actual measure of risk. The precision of each rate estimate was quantified using 95% confidence intervals, which take into account the variability in rate estimates because of chance. Meaning if the rate was to be estimated 100 times, with each individual in the population having the same true probability of the event each time, then 95 of the rate estimates would be contained in the 95% confidence interval. This is commonly interpreted as a 95% probability that the true rate is contained within the interval. Consequentially, when the confidence intervals around two rate estimates do not overlap, it can be inferred at least a 95% probability that the true rates are different.

For displaying the age-adjusted rates geographically, counties were classified as having a rate higher, lower, or not different from the state rate based on whether or not the confidence intervals between the county and state estimates overlapped. An important limitation of this comparison method is smaller population counties have wider confidence intervals, increasing the probability the state and county confidence intervals will overlap. A large county and a small county with the same true rate could be classified as higher from the state rate and not different, respectively, based on the precision of

the rate estimate. Examining confidence interval widths is an important step before making any decisions based on comparisons of rate estimates.

Communicable Disease Indicator Analyses

Data were retrieved from the Montana Infectious Disease Information System (MIDIS) and STD*MIS for the years 2011–2013. Rates for the three years combined were calculated using population data provided by the Office of Epidemiology and Scientific Support (OESS). Rates were reported as the number of events per 100,000 persons per year. The precision of each rate estimate was quantified using 95% confidence intervals. Data were aggregated to the county level using the county of residence at the time of diagnosis. Department of Correction data were included in the county rates were applicable.

Immunization data was obtained from the Vaccines for Children (VFC) Program clinic reviews conducted every other year. The data only included clinics with 11 or more records and children aged 24–35 months as of March 1 of the year of the assessment. Up-to-date is defined as four Diphtheria Toxoid and Acellular Pertussis (DTaP), three polio, one Measles, Mumps and Rubella (MMR), 3/4 Haemophilus Influenza type B (Hib), three hepatitis B, one varicella, and four pneumococcal conjugate vaccine (PCV) by 24 months of age. In 2011, chart reviews occurred. Clinics with less than 50 charts, the review included all available charts. Clinics with more than 50 charts, a sample of charts were reviewed and validated. The total number of charts available in clinics with great than 50 records is unknown. In 2014, all immunization records were reviewed electronically in the Montana Immunization Information System (imMTrax). The precision of each estimate was quantified using 95% confidence intervals.

Maternal Child Health Indicator Analyses

Birth data were tabulated from birth certificates of infants born to Montana-resident mothers who delivered in Montana, 2011–2013, which covers more than 95% of all births. The precision of each rate estimate was quantified using 95% confidence intervals. Demographic information on the birth certificates is self-reported by parents and medical information is abstracted from medical records.

Mortality Indicator Analyses

Mortality data were tabulated from death certificates of Montana residents dying in Montana, 2011–2013, which covers more than 95% of all deaths. Race of decedents was usually reported by their surviving family or friends. Mortality rates were age-adjusted to the 2000 standard population and are reported as the number of events per 100,000 persons per year. The precision of each rate estimate was quantified using 95% confidence intervals. Deaths were classified by Underlying Cause of Death, coded by the National Center for Health Statistics, using the International Classification of Disease, Tenth Revision (ICD-10) (http://www.cdc.gov/nchs/icd/icd10.htm).