State of Alaska Epidemiology Bulletin Recommendations and Reports

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Health Impacts of Alcohol Misuse in Alaska

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Executive Summary

This report presents information from a variety of public health data sources to provide an overview of the use patterns, societal consequences, and health impacts of alcohol misuse in Alaska. The report underscores that Alaskans experience higher rates of alcohol-attributable mortality compared to most other states.

The long-term negative health effects of excessive drinking include widespread tissue damage, leading to birth defects, brain damage, cancer, cardiomyopathy, liver fibrosis/cirrhosis, and skin disorders, among other conditions. A further danger is the development of alcohol use disorder, characterized by a persistent and progressive pattern of abnormal alcohol-seeking behavior leading to tolerance, a compulsive need to drink, and an inability to stop. In 2015, the estimated cost of alcohol abuse to the Alaska economy was $1.84 billion, with the highest cost category being lost productivity, which occurs as a result of premature death, reduced efficiency due to physical and/or mental impairment, employee absenteeism, incarceration for criminal offenses, and medical treatment or hospitalization.

The proportion of adults who self-reported current drinking in 2016 was slightly higher in Alaska compared to the U.S. (57% vs. 54%). During 1991–2016, the proportion of adults who self-reported recent binge drinking was also higher in Alaska compared to the U.S. (19% vs. 16%, respectively). Encouragingly, the proportion of traditional high school students (grades 9–12) who self-reported current drinking in 2015 was substantially lower in Alaska compared to the U.S. (22% vs. 33%, respectively), and the proportion of students who self-reported recent binge drinking in 2015 was also lower in Alaska compared to the U.S. (13% vs. 18%, respectively). During 2015–2016, the rate of alcohol use disorder in Alaska was slightly higher than the 2015–2016 national average (7.3% vs. 6.1%, respectively), and was highest among young adults aged 18–25 years (10.5%).

In 2017, 7.6% of all emergency medical service (EMS) transports in Alaska were alcohol-attributable. During 2015–2016, there were 27,155 alcohol-attributable outpatient discharges; the average charge per outpatient visit was $1,915 (maximum: $51,057), and the total outpatient charges of alcohol-related visits when indicated as the primary diagnosis surpassed $52 million. During 2015–2016, there were 2,368 inpatient alcohol-attributable discharges; the average cost per hospitalization was $39,773 (maximum: $1,653,683), and the total inpatient charges of alcohol-related visits when indicated as the primary diagnosis exceeded $94 million.

Alcohol misuse also results in considerable impact to welfare services and the Alaska justice system. In 2016, almost half of the Alaska children in foster care or in "out of home placements" came from a home with parental or guardian alcohol abuse. During 2006–2016, 47,427 alcohol-attributable criminal justice convictions occurred in Alaska, which represent 18% of all convictions during that time period. Of these convictions, 85% were for driving while intoxicated.

The age-adjusted alcohol-attributable mortality rate in Alaska rose from 15.7 per 100,000 in 1999 to 20.0 per 100,000 persons in 2015. Alaska had the 3rd highest rate in the U.S. of alcohol-attributable mortality that year. Alaska's rate has since increased to 22.0 deaths per 100,000 Alaskans in 2016. Of the 962 alcohol-attributable deaths during 2010–2016, 474 (49%) were among Alaska Native people, who comprise 15% of the population. In 2016, the rate of alcohol-attributable mortality was more than 7 times as high in Alaska Native people than in non-Native Alaskans (80.7 vs. 11.4 deaths per 100,000 persons, respectively). During 2010–2016, 198 more Alaskans died from alcohol-attributable causes (N=962) than from meth- and opioid-attributable causes combined (N=764); however, drug-attributable mortality contributes to a greater number of years of potential life lost than alcohol-attributable mortality.

Perpetually present in the shadows of newly emerging public health concerns, alcohol misuse and its extensive adverse consequences to individuals, families, and communities often gets overlooked. Reasons for this include the longstanding presence of the problem, the cultural acceptability of alcohol in our society, a slower increase in alcohol-attributable mortality in recent years compared to other substances of abuse, and fewer overall years of potential life lost compared to some other substances of abuse. Although thousands of Alaskans undergo treatment for alcohol abuse annually, treatment typically begins after a person has struggled with alcohol use disorder for many years. Finally, in light of the current opioid epidemic and the resurgence of other drugs of abuse and associated poly-substance misuse, it is important to strengthen partnerships between the range of agencies and organizations in Alaska that work to address all types of substance abuse and mental illness.

1.0 Introduction

Alcohol consumption is ubiquitous in the social fabric of many societies worldwide. Yet, it is frequently associated with a wide range of adverse consequences for individuals, families, and communities due to misuse and addiction.

Based on the 2016 National Survey on Drug Use and Health, 87% of U.S. adults aged ≥21 years reported that they drank alcohol at some point in their lifetime, 70% said they drank in the last year, and 56% reported that they drank within the past month.[1] Of those reporting alcohol use in the month preceding the 2016 survey, 26% reported engaging in binge drinking (i.e., ≥4 drinks for women and ≥5 drinks for men in a single occasion) and 7% reported that they binge drank five or more times in the past month. Underage drinking was also prevalent. When persons aged 12–20 years were asked about consumption in the past month, 19% reported drinking alcohol; of those who reported current drinking, 62% reported binge drinking at least once and 24% reported binge drinking five or more times. Of the underage drinkers aged 18–20 years, 39% used alcohol in the past month, 26% binge drank during that month, and 7% binge drank five or more times.[1]

Excessive drinking includes binge drinking, underage drinking, drinking while pregnant, and *heavy* drinking (defined as consuming ≥8 drinks per week for women and ≥15 drinks per week for men). Excessive drinking is responsible for an average of 88,000 deaths per year in the U.S., with an average of 4,300 deaths per year among persons aged <21 years, making it the third leading cause of preventable death, after tobacco use and poor diet and physical inactivity.[2,3,4] Approximately 50% of the 88,000 deaths per year are due to binge drinking.[5] Additionally, it is estimated that excessive alcohol consumption cost the U.S. $249 billion in 2010; of which, binge drinking and underage drinking accounted for 77% and 10% of that cost, respectively.[6,7] About 40% of the total costs of excessive alcohol consumption are borne by taxpayers.[7] The single largest contributor to alcohol-attributable economic costs was reduced workplace productivity. Alcohol misuse is associated with a myriad of health and social problems affecting people's ability to work productively.[5]

Ethyl alcohol is the psychoactive ingredient found in beer, wine, and liquor; it is produced by the fermentation of sugars and starch in the presence of yeast. Ethyl alcohol is rapidly absorbed by the stomach and small intestines into the bloodstream and is metabolized by the liver. The liver is only able to metabolize a certain amount of alcohol at a time, leaving excess alcohol to circulate in the bloodstream until it can be metabolized. Through the bloodstream, alcohol reaches and affects every organ in the body.[8] The effects vary from person to person and depend on a variety of factors such as quantity and frequency of consumption, genetics, age, sex, and presence of underlying medical conditions.

Acute alcohol intoxication occurs when alcohol enters the bloodstream faster than it can be metabolized, which often results in disruptions in mood, behavior, cognition, and coordination; decreased social inhibition; and nausea and vomiting. Short-term health risks of excessive alcohol consumption include injuries, such as motor vehicle crashes and falls; risky sexual behaviors that can result in sexually transmitted infections and unplanned pregnancy; interpersonal conflict while intoxicated can lead to domestic abuse, sexual assault, and violent crime; suicide; harm to developing fetuses, including fetal demise; and overdose, which can lead to respiratory depression, coma, and death.

Long-term heavy drinking frequently leads to serious health effects due to widespread tissue damage. These effects include brain damage (e.g., Wernicke-Korsakoff syndrome), birth defects, cancer (e.g., breast, liver, mouth, skin, throat, and colon), cardiomyopathy, dermatologic conditions (e.g., dermatitis, facial redness, psoriasis, rosacea, spider telangiectasias, and flushing), gastritis/ulcers, hypertension, liver fibrosis and cirrhosis, nerve damage, nutritional deficiency (e.g., vitamins A, B1, B2, B3, and C), pancreatitis, and sexual dysfunction.[9]

A further danger posed to the individual by alcohol misuse is the potential for developing alcohol use disorder (AUD), a term which combines the previously separate disorders of alcohol abuse and alcohol dependence into a single clinical disorder. AUD is characterized by a persistent and progressive pattern of abnormal and intense alcohol-seeking behavior. Over time, dependence results in the development of tolerance, a compulsive need to drink, and an inability to stop.

Alcohol dependence can be viewed as a mechanism by which alcohol consumption is maintained, leading to the wide spectrum of associated adverse physiological

and social consequences.[10] From 2001–2002 to 2012–2013, the 12-month prevalence of AUD in the U.S. increased 49%, representing an additional 12 million Americans with AUD.[11] The described change in definition from alcohol abuse and dependence to AUD did not affect these numbers because any individuals with identified alcohol abuse or dependence were included in the overall calculation of AUD. The increase in individuals with AUD coincided with increases in morbidity and mortality from diseases and injuries in which alcohol use plays a substantial role. This includes deaths due to liver cirrhosis, especially alcohol-related liver cirrhosis, which rose dramatically during 2009–2015 for the first time since the early 1970s.[11,12,13,14] AUD is a highly stigmatized health condition manifested in part through the perception that those affected have personal control over their condition or are to blame for their illness.[15] This promotes the marginalization of individuals suffering from AUD and diminishes their willingness to seek help.[16,17]

The consequences of alcohol misuse extend beyond its potential to cause self-harm. The growing interest in the broader societal concerns associated with alcohol consumption has evolved to characterize alcohol misuse as an agent of social harm. Examples of such harm include the breakdown of families, child neglect, domestic violence, material welfare of families, and mental health problems in family members and close friends (including suicide). These problems are also associated with reduced worker productivity and unemployment.[18] Although harder to measure directly, the qualitative costs of alcohol misuse are necessary to understand the ways in which alcohol's effects extend beyond the drinker to impact family members, friends, and the wider community.

In Alaska, alcohol misuse is a known challenge. Alaska consistently falls among the top states for alcohol-attributable deaths. In 2015, Alaska experienced the third highest rate of alcohol-attributable mortality behind New Mexico and Wyoming.[14] In addition, Alaska faces numerous other alcohol-related challenges, including high rates of alcohol consumption and binge drinking among the adult population and a large proportion of alcohol-related child abuse and neglect. In addition, two of the Healthy Alaskans 2020 health indicators address challenges related to alcohol misuse; one of those being reducing the alcohol-attributable mortality rate.[19]

The purpose of this review is to 1) present trends in alcohol consumption and misuse, 2) summarize the health impacts of alcohol, 3) describe the social repercussions of alcohol misuse, and 4) review Alaska's prevention infrastructure.

2.0 Methods

Data were obtained from multiple surveillance systems and databases described below to provide insight into the prevalence, consequences, morbidity, and mortality associated with alcohol use and abuse in Alaska. The data sources were grouped into one of five categories: consumption, societal consequences, morbidity, mortality, and treatment. The specific information obtained from each data source is outlined below including the available years and demographic information.

Rates and proportions are used to describe the frequency and magnitude of alcohol use behaviors and outcomes. Three- and five-year moving averages may be used to improve visual representation of underlying trends in measures with small numbers. Unless specifically noted, all comparisons or trend descriptions are based on absolute value comparisons and may not reflect statistically significant changes. As such, caution is advised when interpreting differences or drawing conclusions about changes over time.

Lastly, the phrase "alcohol-attributable" is used throughout this report. To say that a condition or incident is alcohol-attributable is to imply (1) that it tends to cluster in time and place with the use of alcohol, or (2) that alcohol is a risk factor for the outcome. However, to say that alcohol is related to, associated with, or linked to a particular behavior or outcome simply suggests that when alcohol is present, this outcome tends to occur. These phrases are not to be mistaken with causality, which will be explicitly mentioned when an outcome is directly caused by alcohol. For instance, in the case of alcohol-impaired motor vehicle accidents or alcohol poisoning deaths.[20]

2.1 Consumption

2.1.1 Alcohol Epidemiologic Data System

The Alcohol Epidemiologic Data System (AEDS), maintained by the National Institute on Alcohol Abuse and Alcoholism, obtains alcohol beverage sales data from all States and the District of Columbia. States provide sales data to AEDS in the form of volume or

tax revenue, which is converted into gallons based on State tax rates. AEDS uses State population estimates for people aged ≥14 years from the Centers for Disease Control and Prevention (CDC) Wide-ranging Online Data for Epidemiologic Research (WONDER) online query system, which provides bridged-race population estimates produced by the U.S. Census Bureau in collaboration with the National Center for Health Statistics. AEDS uses a population of persons aged ≥14 years to calculate per capita consumption rates because most self-report surveys indicate that many 14-year-olds drink alcoholic beverages. AEDS also revises data published in previous reports when the Census Bureau makes revisions to its population estimates (the most recent revision was in 2012). These data are used as denominators to calculate per capita consumption. This *Bulletin* presents trends in consumption of spirits, wine, beer, and all alcoholic beverages purchased through licensed retail vendors in Alaska and the U.S. over the time period 2007–2015.

2.1.2 Liquor Licenses and Local Options

The Alcohol & Marijuana Control Office (AMCO) is a state regulatory agency for control of the manufacture, barter, possession, and sale of alcoholic beverages in Alaska. They maintain an updated list of all liquor licenses held in the State. A beverage dispensary license authorizes the holder to sell or serve alcohol beverages for consumption only on the licensed premises. The holder of a package store license is authorized to sell alcoholic beverages to a person present on the licensed premises or to a person known to the licensee who makes a written solicitation for shipment. Package store licenses do not permit consumption of alcoholic beverages on the licensed premises. From AMCO's list of liquor licenses in the State, the numbers of non-restaurant beverage dispensaries (e.g., bars) and package stores (e.g., liquor stores) are reported.

In addition, AMCO keeps records of all the "local option" laws in the State that provide a method for communities to control and impose certain limits on the availability of alcohol. If a community decides not to allow alcoholic beverages, it is called a "dry" community. If the community allows limited amounts of alcoholic beverages, it is called a "damp" community. Finally, if the community permits both the sale and possession of alcohol, it is called a "wet" community. The most current list of local option communities is from November 2016 and presented in this report.

2.1.3 Adult Consumption

2.1.3.1 Behavioral Risk Factor Surveillance System

The Behavioral Risk Factor Surveillance System (BRFSS) has been implemented by the Alaska Division of Public Health in cooperation with CDC since 1991. It is a telephone survey that utilizes standard protocol and interviewing methods developed by CDC to randomly interview over 200 Alaska residents per month each year. BRFSS data were queried to determine the percentage of adults who reported having used alcohol or engaged in binge drinking on any occasion within a month of the survey. From 1991–2005, binge drinking for adults (men and women) aged ≥18 years was defined as the consumption of five or more drinks on one occasion within the past 30-day period. From 2006 onward, the definition of binge drinking changed from consuming five drinks to consuming four drinks on one occasion within the past 30-day period for women aged ≥18 years. The definition remained the same for men. As the BRFSS survey is summarized annually; data were available for 1991–2016. When available, the 95% confidence intervals for survey data are presented.

2.1.3.2 National Survey on Drug Use and Health

The National Survey on Drug Use and Health (NSDUH) is an annual survey that provides population estimates on substance use and mental health of civilian, noninstitutionalized individuals in the United States. The survey interviews participants aged 12 and older through face-to-face interviews conducted where the respondent lives. According to NSDUH protocol, respondents who report alcohol use on ≥6 days during the past 12 months were assessed for alcohol abuse and dependence. Respondents meet the criteria for alcohol abuse if they report ≥1 alcohol-specific abuse symptoms (e.g., neglect major roles to use alcohol, legal problems, and hazardous use) and if the criteria for alcohol dependence are not met. Criteria for alcohol dependence require the presence of ≥3 alcohol-specific dependence criteria (e.g., tolerance, withdrawal, inability to cut down, and consuming progressively larger amounts). In 2013, the 5th edition of the *Diagnostic and Statistical Manual of Mental Disorders* (DSM-V) combined the previously separate disorders of alcohol abuse and alcohol dependence into a single clinical disorder call alcohol use disorder (AUD). For the purposes of the NSDUH survey, an

alcohol use disorder (AUD) is defined as meeting criteria for either alcohol dependence or abuse. Dependence or abuse is based on definitions found in the DSM-IV. Data on AUD for Alaska adults were presented in this report for 2015–2016, the most recent survey year with available state specific data.

2.1.4 Youth Consumption

2.1.4.1 Youth Risk Behavior Survey

The Youth Risk Behavior Survey, a biennial school-based survey of high school students (grades 9–12), is conducted by the Division of Public Health and administered in cooperation with the Alaska Department of Education and Early Development. It is both anonymous and voluntary. The YRBS has been administered in Alaska since 1995, with weighted (representative) statewide traditional high school data collected in 1995, 2003, 2007, 2009, 2011, 2013, 2015, and 2017. Between 2003 and 2007, there was a change in the criteria for defining American Indian/Alaska Native (AI/AN) adolescents. In 1995 and 2003, if respondents marked Alaska Native or American Indian alone or in combination with another race with known or unknown ethnicity they were classified as AI/AN. In 2007–2017, if respondents marked Alaska Native or American Indian alone or in combination with another race with known ethnicity they were classified as AI/AN. YRBS data for the years 1995–2017 were queried to determine the percentage of Alaska adolescents who reported ever drinking alcohol, having their first drink of alcohol before age 13 years, and binge drinking (5+ drinks within a couple of hours in the month preceding the survey). In 2017, the definition of binge drinking changed for females from consuming ≥5 drinks to ≥4 drinks within a couple of hours. The definition of binge drinking for males remained at consuming ≥5 drinks within a couple of hours. Unless otherwise stated, the estimates are based on Alaska adolescents (students in grades 9–12) in public traditional high schools, excluding boarding, correspondence, home study, alternative, and correctional schools. Alternative high schools serve at-risk students who benefit from non-traditional school settings and programs. Estimates for alternative high school students are explicitly stated. When available, the 95% confidence intervals for survey data are presented.

2.1.4.2 National Survey on Drug Use and Health

Data on AUD for Alaska adolescents (12–17 years) were presented in this report for the NSDUH survey year 2015–2016. See additional methods in Section 2.1.3.2.

2.1.5 Consumption Before and During Pregnancy

2.1.5.1 Pregnancy Risk Assessment Monitoring System

The Alaska Pregnancy Risk Assessment Monitoring System (PRAMS) Project is an on-going survey of mothers of newborns initiated by the Alaska Division of Public Health's Section of Women's, Children's, and Family Health in 1990. PRAMS collects state-specific, population-based data on maternal attitudes and experiences before, during, and after pregnancy. Approximately one of every six mothers of newborns is selected for PRAMS. Mothers are randomly selected from birth records from the Health Analytics and Vital Records Section with data collection procedures and instruments standardized to allow comparisons among states. Data collection is primarily by mail but also includes telephone follow-up. PRAMS collects data on alcohol use 3 months before and during the last 3 months of pregnancy. Alaska PRAMS data for 2009–2015 was queried to determine the percentage of women who drank any amount of alcohol and who binge drank at least once 3 months before pregnancy or during the last 3 months of pregnancy. Binge drinking was defined as four alcoholic drinks or more in a 2-hour time span.

Data were obtained for BRFSS, YRBS, and PRAMS using the 'Explore Datasets' query module in the Alaska Indicator Based Information System (AK-IBIS). Using this tool, the 'BRFSS', 'YRBS-Statewide', and 'PRAMS' datasets were queried and stratified by characteristics such as region, sex, race, and type of high school.

2.2 Societal Consequences

2.2.1 Alaska Uniform Response Online Reporting System

The Alaska Uniform Response Online Reporting Access (AURORA) system is the Alaska-based public patient care reporting database for certified Emergency Medical Service (EMS) providers.

AURORA provided syndromic surveillance data on patients transported by Alaska EMS providers to local hospitals during 2017. Alcohol-attributable EMS transports were included in the analysis if the words "ETOH" or "alcohol" appeared in either text field for primary and secondary impression upon arrival at the scene. Duplicate reports were eliminated. AURORA data was also queried for opioid-attributable EMS transports to provide context for the burden of alcohol on Alaska EMS. Opioid-attributable transports were included if an individual received at least one dose of naloxone from EMS.

2.2.2 Protective Service Reports

The Office of Children's Services (OCS) receives protective services reports (PSR) of allegations of child maltreatment. One family or family unit may have multiple PSRs reported to OCS. The PSR triggers a response from OCS, which includes interviews with alleged victims, conducted face-to-face when possible, and gathering of other related information that will help determine appropriate agency action. If the available information indicates that the child is either unsafe or at high-risk for maltreatment by their parent/caregiver, the report will be "screened in" for an initial assessment (IA). The IA requires OCS to conduct an investigation that is geared to evaluate the obvious present danger, but also the entire family and their overall functioning. For each IA, the case worker has to document characteristics about the family even if they are unrelated to the original PSR. Although, characteristics documented in the IA are not necessarily the reason for removal, they are likely influential or contributory factors and provide a more comprehensive, well-documented report after a PSR is screened-in. Examples of characteristics that OCS can document include exposures to domestic violence, mental illness, drug abuse, and alcohol abuse. For the purposes of this report, we focus on cases involving alcohol abuse, however alcohol misuse is often part of a greater polysubstance abuse and therefore it is likely other substances of abuse are also involved.

OCS records for 2016 were queried for all screened-in PSRs and substantiated IAs with an alcohol abuse characteristic. A family or family unit receives an alcohol abuse characteristic when alcohol is identified as a factor that negatively affects the parent or caregiver's ability to parent. Records prior to 2016 could not be queried due to the absence of database fields that allowed for reliable collection of substance abuse characteristics. In addition, records of every child living out of home on a randomly selected day (July 19, 2017; n=3,040) were queried for an IA with an alcohol abuse characteristic and a removal reason of parental alcohol abuse to offer a sense for the role alcohol plays in child maltreatment and removals from the home.

The OCS regional breakdown is as follows:

- Anchorage (Municipality of Anchorage, Eagle River, Chugiak, and Whittier)
- Northern (Fairbanks, Nome, Kotzebue, Barrow, Galena, McGrath, Delta Junction, and the surrounding areas)
- Southcentral (Wasilla, Kenai, Valdez, Kodiak, Dillingham, Homer, King Salmon, Gakona, Seward, Unalaska, and the surrounding areas)
- Southeastern (Juneau, Craig, Sitka, Petersburg, Ketchikan, and the surrounding areas)
- Western (Bethel, St. Mary's, Aniak, and the surrounding areas)
- Note: OCS no longer has staff based in Galena or Unalaska, but both communities are served by other field offices in the Northern and Southcentral region.

More detailed definitions of OCS terminology as well as a case flowchart from intake to case closure can be found on the OCS website.[21]

2.2.3 Law Enforcement Bookings and Convictions

The Alaska Department of Corrections (DOC) collects data on the number of bookings and convictions that result from specific offenses. The counts are by offenses and not offender; therefore, if an offender is booked or convicted for multiple offenses, each offense is counted. Only offenses booked into a DOC facility and convictions resulting in incarceration are included. In addition, it is important to note that it is possible for a person to be booked for multiple offenses, but only convicted for one of them or convicted for another offense entirely. Data on convictions from 2006–2016 are presented in this report and further analyzed by type of alcohol-attributable offense, age, sex, and race.

2.2.4 Law Enforcement Referrals and Charges of Juveniles

The Division of Juvenile Justice (DJJ) collects and reports on the number and type of referrals and charges involving juveniles (<18 years of age). A referral is

considered a request by a law enforcement agency for a DJJ response following the arrest of a juvenile or as a result of the submission of a police investigation report alleging the commission of a crime or violation of court order. A referral is counted as a single episode, but it may relate to multiple charges. Some juveniles may be referred multiple times within the year. Each charge is included under a single referral episode. Data from DJJ were queried for alcohol-attributable referrals and charges linked to alcohol-attributable referrals for FY13–FY17. The numbers were further analyzed by sex and race.

2.2.5 School Suspensions and Expulsions

School districts annually report all discipline incidents resulting in a suspension or expulsion to the Alaska Department of Education and Early Development (DEED) through an online reporting process. Suspension and expulsion data for the 2015–16 school year were queried for alcohol-attributable offenses. An alcohol offense can include an incident in which a student used or possessed alcohol on school grounds or an incident involving a student under the influence of alcohol on school grounds. All counts of alcohol-attributable offenses only include incidents that resulted in either a suspension or an expulsion.

2.3 Morbidity

2.3.1 Alaska Trauma Registry

The Alaska Trauma Registry (ATR) started collecting data in 1991 from all 24 of Alaska's acute care hospitals to evaluate the quality of trauma patient care and to improve and expand injury prevention programs. Patients with injuries are included in the trauma registry if they are admitted to an Alaska hospital, held for observation, transferred to another acute care hospital, or declared dead in the emergency department within 30 days of the injury. Injuries included are due to trauma, poisoning, suffocation, and the effects of hypothermia, in addition to other underlying causes.

The reports to ATR should be considered an under-ascertainment of injuries associated with alcohol. Injury resulting from someone else's alcohol involvement may not be captured by the registry. For example, a hospitalized injury victim would be reported to the registry (alcohol suspected or proven would be noted); however an intoxicated all-terrain vehicle driver causing the pedestrian-vehicle crash would not be reported to the registry unless the driver was hospitalized for injuries (alcohol suspected or proven would be noted). Beginning in 2011, hospitalizations for intentional (suicide or suicide attempt) and unintentional poisonings among persons aged ≥18 years were no longer collected and entered into the ATR. Work-related and unintentional inhalation poisonings for persons aged ≥18 years are still included. In order to isolate alcohol-attributable hospitalizations from 1991–2015, toxicology results were examined. All hospitalizations in which the patient tested positive for alcohol or were suspected to be under the influence of alcohol were included in the study, regardless of the type of injury for which the patient was hospitalized. For the years 2009–2015, there is an "injury cause" free-text column that can be queried to search for alcohol-attributable hospitalizations if no alcohol toxicology test was performed. If the words "alcohol" or "ETOH" were present without "deny", "denies", "no" or "unknown" before or after these words, the patient was included as an alcohol-attributable hospitalization.

2.3.2 Health Facilities Data Reporting Program

The Health Facilities Data Reporting Program (HFDR), managed by the Health Analytics and Vital Records Section, collects inpatient and outpatient discharge data from Alaska health care facilities, which show the utilization of health services and provide evidence of the conditions for which people receive treatment. Originally developed in 2001 as the Alaska Hospital Discharge Database (HDD) under the Alaska State Hospital and Nursing Home Association, hospitals voluntarily agreed to participate and report on inpatient discharge data only. It was not until 2008 that outpatient discharges were added to the database, which added such things as emergency department visits and outpatient surgeries. From 2001–2012 the HDD represented about 75% of discharges statewide, but due to voluntary reporting, the hospitals reporting discharges during those years varied. Regulation to mandate reporting became effective in December 2014 as the HFDR program managed by the State, and thus data for 2015–2016 captures about 90% of statewide discharges. For this reason, only the calendar years 2015 and 2016 were analyzed for this report.

HFDR differs from the Alaska Trauma Registry, in that HFDR uses billing data from hospitals and other facilities for research and analysis beyond just injury surveillance. ATR uses clinical hospital data for

injuries of the most serious cases in Alaska, including data on the underlying causes of the trauma.

HFDR from 2015–2016 was queried for alcohol-attributable ICD-9 and ICD-10 codes (ICD-9-CM coding changed to ICD-10-CM on October 1, 2015). A list of query codes used can be found in the Appendix. The resulting dataset represented all discharges with a primary diagnosis of an alcohol-attributable condition. The records were analyzed for rates of alcohol-attributable discharges, average charge and length of stay of all visits, and type of care (i.e., emergent, urgent, or elective). HFDR contains billed charges, which may not reflect what the payer has negotiated for a given service. The data were further stratified by sex, race, and location.[22] Per person discharge rates were calculated using population estimates for 2015 and 2016 from the Alaska Department of Labor and Workforce Development.

2.3.3 Alaska Birth Defects Registry

The Alaska Birth Defects Registry (ABDR) is a modified passive surveillance system as data collection relies on reporting by major hospitals, specialty clinics, and medical record aggregators. Alaska regulations require health care providers to report to the ABDR all children diagnosed or treated with a reportable birth defect up to age 6 years on the date of service. To produce more timely data, all registry estimates are restricted to children reported, diagnosed, or treated before age 3 years. More detailed information on data collection can be found on the ABDR web page.[23]

ABDR collects data on the fetal alcohol spectrum disorders (FASDs), which are a group of conditions that occur in a child whose mother drank alcohol during pregnancy. The effects of FASDs can include physical abnormalities as well as problems with behavior and learning. Fetal alcohol syndrome (FAS) falls on the most severe end of the FASDs. Usually the symptoms of FAS are more acute as children often have growth and central nervous system (CNS) problems in addition to problems with learning, memory, communication, vision, and/or hearing. This can affect a child's ability to relate to their peers and succeed in school.[24]

Because of the limitations in FAS diagnosis and subsequent ICD-CM coding practices, the ABDR has developed and implemented a novel methodology based on a Bayesian approach to estimate statewide prevalence of FAS. The ABDR program methodology and lack of standardized diagnostic criteria for the entire FASD limits the ABDR program to estimating only FAS prevalence at this time. The annual prevalence of FAS occurring among live births was derived using the observed probability of being reported with the defect, and positive predictive value (PPV) and one minus negative predictive value (NPV). This is expressed as $P(A) = [P(B) * PPV] + [1 - P(B) * (1 - NPV)]$. PPV and NPV estimates for FAS are derived by utilizing information regarding confirmed classification of FAS through FASD diagnostic teams, historical medical records review, and case abstraction. More detailed information on the methods can be found on the ABDR webpage.[25]

2.4 Mortality

2.4.1 Alaska Vital Statistics

Death certificates from the Alaska Vital Statistics (AVS) system, managed by the Health Analytics and Vital Records Section, were analyzed for acute-alcohol poisonings and alcohol-attributable deaths during 1977–2017. In addition, mortality data for opioids and methamphetamines were included to provide context for the burden of alcohol mortality among other substances of abuse. A list of query codes and text searches used can be found in the Appendix. Data from 2017 are preliminary and subject to change therefore they are presented separately from the previous years and not included in reported totals and averages. Acute-alcohol poisoning and alcohol-attributable deaths included all deaths that happened within the state of Alaska regardless of the deceased's state of residency.

Alcohol-attributable deaths were defined as deaths with underlying causes of alcohol abuse (F10.0-F10.1), alcoholic psychosis (F10.3-F10.9), alcohol dependence syndrome (F10.2), alcohol-attributable pseudo-Cushing's syndrome (E24.4), degeneration of nervous system due to alcohol (G31.2), alcohol polyneuropathy (G62.1), alcoholic myopathy (G72.1), alcohol cardiomyopathy (I42.6), alcoholic gastritis (K29.2), alcoholic liver disease (K70-K70.4, K70.9), alcohol-attributable chronic and acute pancreatitis (K86.0, K85), excessive blood level of alcohol (R78.0), alcohol poisoning (X45 and Y15), or suicide by exposure to alcohol (X65). Acute-alcohol overdoses were isolated from all alcohol-attributable deaths using ICD-10 codes X45, Y15, and X65. Data from 2000–2017 used ICD-10 codes. For years prior

to 2000, equivalent ICD-9 codes were used to isolate alcohol-attributable and acute-alcohol deaths (i.e., 291, 303, 305.0, 357.5, 425.5, 535.3, 571.0-571.3, 790.3, and 980-980.X).

2.4.2 Traffic Safety

The National Highway Traffic Safety Administration (NHTSA) collects data on motor vehicle crashes and fatalities through the Fatality Analysis Reporting System (FARS) and the General Estimates System (GES), which contains data derived from a census of fatal traffic crashes nationwide. NHTSA has agreements with agencies in each State government to provide specific information in a standardized format on fatal crashes occurring in the State. To be included in NHTSA's data, a crash must involve a motor vehicle traveling on a roadway customarily open to the public and must result in the death of at least one person (occupant of vehicle or a non-motorist) within 30 days of the crash. There are seven categories that NHTSA uses for motor vehicles, including automobile, utility vehicle, bus, motorcycle, single unit truck, truck combination (e.g., single unit truck and full trailer), and other motor vehicle (e.g., ATV, snowmobile, golf cart).[26] An alcohol-impaired driving fatality is defined as a fatality from a motor vehicle crash involving a vehicle operator with a blood alcohol concentration (BAC) of ≥0.8 g/dL. The number and percentage of alcohol-impaired driving fatalities in Alaska from 1994–2016 were obtained from the publically available Traffic Safety Facts Annual Report Tables on the United States Department of Transportation website.[27] Note that 2015 and earlier year NHTSA data are final and generally not subject to change. The 2016 data are preliminary and subject to change when finalized. Alcohol-impaired driving fatalities were reported as counts and as a percentage of total driving fatalities.

2.5 Treatment

2.5.1 Alaska's Automated Information Management System

Alaska's Automated Information Management System (AKAIMS) is a web-based application maintained by the Division of Behavioral Health that receives client-level data submitted from community behavioral health treatment centers. In addition, AKAIMS receives data from agencies that wish to use the system voluntarily for their electronic clinical records or business intelligence components. AKAIMS was built to fulfill federal reporting requirements set forth by the Substance Abuse and Mental Health Administration (SAMHSA). There is presently a state mandate for grantees to enter data; however, behavioral health services or agencies that do not receive any form of public funds are not required to use AKAIMS.

AKAIMS treatment data from state FY 2015 through state FY 2017 were analyzed for the number of people admitted and served for alcohol and drug substance abuse. To be served for alcohol or drug substance abuse, one has to have one or more encounter notes from a treatment facility. These data included admissions of persons with alcohol as their only substance of abuse and persons with substance abuse of alcohol and drugs. Alcohol could be a primary, secondary, or tertiary substance of abuse in the admissions of persons with alcohol and drug abuse. The distinction between primary, second, and tertiary substance abuse is based on the provider's clinical judgment. It should be noted that some individuals may be admitted in one fiscal year and served in another. Other individuals may be served across multiple years and are thus counted each year they are served. Admissions data were further analyzed by type of service and treatment setting, which included detox facilities, residential programs, and outpatient care. A more detailed description of each type of service and treatment setting is available on the Treatment Episode Data Set (TEDS) webpage.[28]

3.0 Results

3.1 Consumption

Alcohol consumption rates were consistently higher in Alaska than for the entire nation for all alcohol-containing beverages. Consumption of spirits, the most widely consumed alcoholic beverage in Alaska since 2007, was 1.5 times the national average in 2015 (Table 1). The amount of alcohol consumed per capita in Alaska has remained relatively stable since 2011 (Figure 1).

As of 2017, there were 750 alcohol distribution centers throughout Alaska, including 399 beverage dispensaries (establishments serving liquor by the drink) and 351 package stores. Locations in Anchorage, Fairbanks, Mat-Su, and Juneau accounted for 248 (62%) and 195 (56%) of all beverage dispensaries and package stores, respectively.[29]

As of November 2016, 109 communities had some restriction that prohibits the sale, import, or possession of alcohol making them "damp" or "dry" communities. Of those communities, 95 (87%) ban the sale of alcohol and 32 (29%) ban the sale, importation, and possession of alcohol (Figure 2).[30]

3.1.1 Adult Consumption

According to BRFSS reports from 1991–2016, the number of Alaska adults that self-reported consuming at least one drink of an alcoholic beverage within the past month at the time of the survey ranged from a high of 66% (95% CI = 62–69) in 1994 to a low of 53% (95% CI = 50–56) in 2007. In 2016, 58% (95% CI = 56–60) of all Alaska adults, 63% (95% CI = 60–65) of White adults, and 44% (95% CI = 40–49) of Alaska Native adults reported current drinking during the 30 days prior to the survey date. The Southeast region had the highest percentage of adults consuming alcohol in 2016 (62%; 95% CI = 57–66) followed by the Anchorage, Mat-Su, Interior, Gulf Coast, and Southwest regions, while the Northern region experienced the lowest percentage (36%; 95% CI = 27–45). Yearly and on average during 1991–2016, males consistently reported higher percentages of current drinking (64%; 95% CI = 63–65) compared to females (52%; 95% CI = 51–53).

Considering all types of alcoholic beverages, the percentage of Alaska adults who reported binge drinking (≥5 drinks for men and ≥4 drink for women) during the past 30 days has fluctuated over the past two decades, ranging from a high of 25% (95% CI = 22–28) in 1994 to a low of 16% (95% CI = 15–18) in 2008 (Figure 3). The percentage of adults reporting binge drinking has been consistently higher in Alaska than the U.S. overall during 1991–2016, with an average of 19% (95% CI = 19–20) compared to 16%, respectively. The proportion of binge drinking in 2016 of 18% (95% CI = 17–20) for all Alaskan adults was below the Healthy Alaskans goal of <20%. Alaska Native adults were slightly above the Healthy Alaskans goal at 21% (95% CI = 18–26).[31] Overall, a greater percentage of males report binge drinking during 1991–2016. In 2016, 22% (95% CI = 19–24) of males and 15% (95% CI = 13–17) of females reported binge drinking. The Northern region reported the highest percentage of binge drinking (26%; 95% CI = 18–36) in 2016 followed by the Southeast, Interior, Southwest, Gulf Coast, and the Matanuska-Susitna Borough regions, while Anchorage experienced the lowest percentage (16%; 95% CI = 13–20).

The 2015–2016 NSDUH survey documented that 7.3% of Alaska adults met the criteria for an *alcohol use disorder*, which was defined as either meeting the criteria for alcohol dependence or abuse. Alaska's rate of alcohol use disorder was slightly higher than the 2015–2016 national average (6.1%). In Alaska, young adults aged 18–25 years had the highest proportion of alcohol use disorder per year (10.5%) of any age group. Nationwide, this demographic also had the highest proportion of AUD (10.8%).

3.1.2 Youth Consumption

Since 1995, data from the YRBS show that the proportion of Alaska adolescents (grades 9–12 in traditional high schools) who reported ever drinking alcohol (1+ drinks) declined from 80% (95% CI = 78–82) in 1995 to 54% (95% CI = 51–58) in 2015. Alternative high schools in Alaska, which have historically had higher percentages of alcohol use, have not seen such a marked decline in alcohol use. In 2015, more than 77% (95% CI = 74–80) of students still reported having consumed one or more alcoholic drinks compared to 88% (95% CI = 86–90) in 2009. Data prior to 2009 are not available for alternative high schools. The national percentage in traditional high schools has also been slower to decrease, as 80% (95% CI = 78–82) of students nationally reported ever drinking in 1995 compared to 63% (95% CI = 61–66) in 2015.[32]

Since 1995, both Alaska and the U.S. have seen declines in the percentage of youth initiating drinking before 13 years of age. In Alaska, the percentage of high school students at traditional schools reporting drinking before age 13 years fell from 37% (95% CI = 34–40) in 1995 to 14% (95% CI = 12–17) in 2015. The proportion of the U.S. traditional high school population decreased from 32% (95% CI = 30–35) in 1995 to 17% (95% CI = 16–18) in 2015. However, that same year, 26% (95% CI = 23–29) of Alaska high school students in alternative high school settings reported drinking before 13 years of age.

In 2015, the prevalence of binge drinking in Alaska was 13% (95% CI = 11–15) among all Alaska traditional high school students; there was no statistically significant difference by student race. Since Alaska started collecting binge drinking data, the prevalence among all Alaska traditional high school students fell steadily from 31% (95% CI = 28–35) in 1995 to 13% (95% CI = 11–15) in 2015 (Figure 4)). Among Alaska alternative high school students

28% (95% CI = 25–31) reported binge drinking in 2015.

In 2017, the percentage of Alaska traditional and alternative high school students who reported ever drinking alcohol (1+ drinks) was 57% (95% CI = 54–60) and 75% (95% CI = 70–79), respectively. The percentage of traditional and alternative high school students reporting binge drinking in the past 30 days was 14% (95% CI = 12–17) and 29% (95% CI = 25–32), respectively. However, the 2017 YRBS survey reflects a change in the binge drinking definition for females from five or more drinks of alcohol in a row to four or more drinks, which makes it difficult to compare the binge drinking prevalence between these years. Partially as a result of this change, the percentage of female traditional high school students reporting binge drinking in the past 30 days increased from 12% (95% CI = 10–15) in 2015 to 17% (95% CI = 13–22) in 2017. Similarly, the percentage of female alternative high school students reporting binge drinking increased from 30% (95% CI = 26–36) in 2015 to 32% (95% CI = 27–37) in 2017 after having decreased from 39% (95%CI = 34–45) in 2013.

The 2015–2016 NSDUH survey estimated that 2.6% of adolescents (aged 12–17 years) in Alaska met the criteria for an alcohol use disorder, which was slightly higher than that for the general U.S. adolescent population at 2.2%.

3.1.3 Consumption Before and During Pregnancy

During 2009–2015, the average percentage of women who reported that they drank alcohol 3 months before pregnancy was 59% for all mothers (range: 58%–62%), while the percentage of women who drank during the last 3 months of pregnancy increased from 5.6% in 2009 to 6.8% in 2015 (Figure 5). Conversely, the percentage of mothers who binge drank either before or during pregnancy decreased for all women. Overall, <1% of mothers reported binge drinking during the last 3 months of pregnancy (Figure 5).

During 2009–2015, White mothers had on average a higher rate of drinking 3 months before and during the last 3 months of pregnancy compared to Alaska Native women, but Alaska Native women consistently reported higher rates of binge drinking before and during pregnancy (Table 2). On average, the highest rates of drinking during the last 3 months of pregnancy by age and region were among women aged 35–39 years (12%) and those living in the Anchorage and Gulf Coast regions (7.6% and 7.7%, respectively). However, women aged 20–24 years and those living in the Northern region reported on average higher rates of binge drinking during the last 3 months of pregnancy (1.5% and 2.6%, respectively; Table 2).

The percentage of Alaska women reporting drinking during the last 3 months of pregnancy has historically been comparable to the multistate PRAMS average, which was 6.7% in 2009 and increased to 8.0% in 2015.[33]

3.2 Societal Consequences

3.2.1 Alcohol-attributable EMS Transports

In 2017, 2,624 patients were transported to local hospitals by Alaska EMS for alcohol-attributable reasons; 665 (25.3%) and 656 (25.0%) of these transports occurred in Anchorage and Bethel, respectively. Of the 2,624 patients transported, 1,435 (55%) were male, 1,732 (66%) were aged 31–60 years, and 1,594 (61%) were Alaska Native people (Table 3). Alcohol-attributable transports in 2017 accounted for 7.6% of all reported transports made by Alaska EMS providers. By comparison, the number of opioid-related transports during this same time period was 1,943, which represented only 1.5% of all EMS transports.

3.2.2 Office of Children's Services

In 2016, 9,505 protective service reports (PSR) were screened-in by OCS and 2,068 of those were substantiated through an initial assessment (IA) investigation.

Of the 9,505 PSRs that were screened-in, 17% (1,645) had an alcohol abuse characteristic. Of the 2,068 reports that were substantiated after an IA, 26% (536) had an alcohol abuse characteristic. The Western region saw the highest percentage of substantiated reports with alcohol abuse characteristics (48%) in 2016.

As of July 2017, 3,040 children statewide were living out of the home and 1,010 (33%) were removed due to parental alcohol abuse; 1,676 had an IA within 1 year of being removed from their home and 756 (45%) had a documented alcohol abuse characteristic in their IA. In the Western region, 68% (138/203) of children who were living out of the home were removed due to parental alcohol abuse (Figure 6) and 91% had a

documented alcohol abuse characteristic when an IA was completed.

3.2.3 Adult Corrections

During 2006–2016, there were 47,427 alcohol-attributable convictions in Alaska, which represented 18% of all convictions during that time period. Of the all alcohol-attributable convictions in Alaska, 85% (40,081) were driving while intoxicated charges and 5% (2,704) involved minors. Of all offenders with an alcohol conviction in Alaska, 58% (27,292) were White, 72% (34,286) were male, and 59% (28,130) were aged 21–40 years.

3.2.4 Juvenile Corrections

During FY2013–FY2017, there were 15,212 referrals to the Division of Juvenile Justice (DJJ); of which, 7% (1,112) were alcohol-attributable. The proportion of referrals to DJJ that are alcohol-attributable has steadily decreased from 11% (367) in FY13 to 5% (121) in FY17, representing a 67% decrease in the number of alcohol-attributable referrals. The total number of general referrals to DJJ decreased 28% from 3,470 in FY13 to 2,481 in FY17. Alaska Native people and Whites represented 60% (670) and 25% (279) of all alcohol-attributable referrals; males accounted for 70% (776) of all alcohol-attributable referrals.

3.2.5 School Expulsions and Suspensions

During the 2015–2016 school year, 0.5% (101/20,537) suspensions (in-school and out-of-school) were alcohol-attributable. Of the 101 alcohol-attributable suspensions, 97 (96%) resulted in out-of-school suspensions and 58 (57%) occurred in the Anchorage and Matanuska-Susitna Borough School Districts. Over the last 5 school years (2012–13 through 2015–16), 613 alcohol-attributable school suspensions occurred, to which the 2015–16 school year contributed the least.

3.3 Morbidity

3.3.1 Hospital Care for Alcohol-attributable Injuries

According to the Alaska Trauma Registry (ATR), the proportion of injury hospitalizations that were alcohol-attributable during 1991–2015 has ranged from 17%–25% (Figure 7). Of the 24,775 people hospitalized for an alcohol-attributable injury since 1991, 13,908 (56%) were Alaska Native people and 8,929 (36%) were White, 15,947 (64%) were male, and 7,101 (28%) were located in the Anchorage area.

During 1998–2010, 23%–25% of all injury hospitalizations were alcohol-attributable. Starting in 2011, the percentage dropped to 20% and continued to decrease through 2013 when 17% of all injury hospitalizations were alcohol-attributable. This apparent decrease in alcohol-attributable injury hospitalizations is partly due to the exclusion of intentional (suicide and suicide attempt) and unintentional poisonings of individuals aged ≥18 years starting in 2011 (Figure 7). During 1991–2010, suicide attempts accounted for 23% (4,976) of all alcohol-attributable injury hospitalizations, followed by falls, assault, and motor vehicle accidents (20%, 20%, and 13%, respectively).

3.3.2 Hospital Care for Alcohol-attributable Visits

During 2015–2016, 29,523 hospital discharge records were identified through HFDR with a primary diagnosis of an alcohol-attributable condition; 2,368 were inpatient and 27,155 were outpatient (e.g., emergency department, outpatient surgery, outpatient observation); 16,028 (54%) had a primary diagnosis of alcohol abuse without dependence; 7,965 (27%) had a primary diagnosis of alcohol dependence syndromes; 1,925 (7%) had a primary diagnosis of alcohol-attributable mental disorders; and 88 (0.30%) had a primary diagnosis of alcohol intoxication or excessive blood level of alcohol (Table 4).

Of these 29,523 alcohol-attributable discharges, 17,071 (58%) involved males and 19,892 (67%) involved Alaska Native people. Regions with the highest proportion of alcohol-attributable discharges were the Northern region (17.5 alcohol-attributable discharges per 1,000 discharges), followed by the Southwest, Southeast, Interior, Anchorage, Gulf Coast, and Mat-Su regions (16.6, 16.4, 14.8, 9.2, 5.5, and 5.0 alcohol-attributable discharges per 1,000 discharges, respectively).

Of the 27,155 outpatient discharges, 71% (19,232) were emergency room visits. The rate of alcohol-attributable hospital care was 19.0 per 1,000 population in 2015 and increased to 21.0 per 1,000 population in 2016. This slight increase is mostly attributable to an increase in outpatient care from 17.5 per 1,000 population in 2015 to 19.3 per 1,000 population in 2016 (Figure 8). The rates by race were highest among Alaska Native people (88.2 per 1,000

population), who experienced 11.5 times the rate of alcohol-attributable hospital discharges compared to non-Native Alaskans (7.7 per 1,000 population; Table 4).

Of the 2,368 inpatients who were discharged, 1,435 (61%) were male and 1,159 (49%) were Alaska Native people. By admission type, 1,365 (58%) were admitted for emergency care, 755 (32%) for urgent care, and 199 (8%) for elective care. The median length of stay was 4 days (range: 1–215 days). The average charge per hospitalization was $39,773 (maximum: $1,653,683). The total inpatient charges of alcohol-attributable visits when indicated as the primary diagnosis exceeded $94 million in 2015–2016.

Of the outpatient discharges identified, 15,636 (58%) were male and 18,733 (69%) were Alaska Native people. By admission type, 11,717 (43%) were admitted for emergency care, 5,338 (20%) for elective care, and 5,432 (20%) for urgent care. The average charge per outpatient visit was $1,915 (range: $0–$51,057). The total outpatient charges of alcohol-attributable visits when indicated as the primary diagnosis surpassed $52 million in 2015–2016.

In 2016, 39% of outpatients had more than one alcohol-related outpatient discharge, accounting for 73% of total alcohol-related outpatient discharges. Similarly, 34% of emergency department (ED) patients had more than one alcohol-related ED discharge, accounting for 69% of all alcohol-related ED discharges.

3.3.3 Fetal Alcohol Syndrome (FAS)

During 2007–2013, among children born to Alaska resident mothers, ABDR received 404 reports of FAS through ICD CM codes and FASDs diagnostic clinics. Assuming that the derived confirmation probability described in the methods holds true for all reports of FAS in the ABDR system during 2007–2013, the estimated prevalence of live births in Alaska with an FAS diagnosis is 1.7 (95% CI = 1.4–2.0) per 1,000 live births. This estimate has remained relatively constant throughout 2007–2013 (Figure 9). Relative to babies born to White mothers, the prevalence of FAS among babies born to Alaska Native mothers was 3.2 times higher (1.1 and 3.5 per 1,000 live births, respectively). Likewise, FAS was 3.5 times as likely for babies with a birth weight of <2,500 grams compared to babies born at 2,500+ grams (6.0 and 1.4 per 1,000 live births, respectively).

3.4 Mortality

3.4.1 Alcohol-attributable Fatalities

During 1977–2016, 3,699 deaths attributed to alcohol as the underlying cause of death were identified through AVS. This number has been steadily rising since 1977 from 53 deaths in 1977 to 176 deaths in 2016, representing a rate increase from 12.7 to 23.8 deaths per 100,000 individuals. Most strikingly, during 2010–2012, Alaska had the highest rate of alcohol poisoning deaths in the nation with an average of 4.7 deaths per 100,000 persons compared to the U.S. average of 0.9 deaths per 100,000 persons.[34] Additionally, in 2015, the age-adjusted alcohol-attributable mortality rate in Alaska was 21.3 deaths per 100,000 Alaskans, while the average rate for the U.S. was 9.1 per 100,000 persons.[14]

Alaska Native people and Whites accounted for 1,882 (51%) and 1,727 (47%) of all alcohol-attributable deaths during 1977–2016, respectively. Alaska Native people and Whites accounted for 398 (60%) and 247 (38%) of all acute-alcohol poisoning deaths since 1977, respectively. Of the 273 (20%) alcohol-attributable deaths due to acute poisonings during 2007–2016, 191 (70%) were in Alaska Native people and 78 (29%) were in Whites. During those 10 years, the highest rates of alcohol-attributable mortality occurred in males and persons aged 55–64 years (22.5 and 44.5 alcohol-attributable deaths per 100,000 persons, respectively).

On average since 1990, Alaska Native people experienced rates of alcohol-attributable mortality that were over 5 times higher than those experienced by non-Native Alaskans (61.3 and 11.2 deaths per 100,000 persons, respectively; Figure 11). Most recently, in 2016, Alaska Native people experienced over 7 times the rate of alcohol-attributable mortality compared to non-Native Alaskans (80.7 versus 11.4 alcohol-attributable deaths per 100,000 persons, respectively).

By public health region, the Northern region had consistently higher rates of alcohol-attributable mortality from the 1990s through the early 2000s, reaching a rate of 45.6 alcohol-attributable deaths per 100,000 persons during 1999–2003 (Figure 12). More recently, this rate has decreased in the Northern region, and the alcohol-attributable mortality rate in Anchorage has now surpassed that of the Northern region. Since 1990, Mat-Su and the Gulf Coast regions

have consistently seen the lowest rates of alcohol-attributable mortality.

During 2010–2016, there were more alcohol-attributable deaths than methamphetamine- and opioid-related deaths combined. However, opioid over dose deaths have consistently been higher than acute-alcohol poisoning deaths since 2010, and methamphetamine overdose deaths surpassed acute-alcohol poisoning deaths in 2012 and in 2016 (Figure 13). In addition, drug-attributable mortality contributes to a greater number of years of potential life lost (YPLL) compared to alcohol-attributable mortality.[35] In 2016, drug-attributable deaths were responsible for 4,499 YPLL, with 34.3 years lost prematurely for each death on average compared to 4,202 YPLL and 23.1 years lost prematurely for each alcohol-attributable death on average.[35] Furthermore, the age-groups with the highest mortality rates were 55–64, 45–54, and 25–34, for alcohol-, meth-, and opioid-attributable causes, respectively.

Preliminary 2017 data indicate that the crude rate of alcohol-attributable death has decreased from 23.8 in 2016 to 20.9 per 100,000 persons in 2017. This is likely due to the decrease from 91 to 77 deaths in Alaska Native people representing a drop in mortality rate from 80.7 to 66.8 per 100,000 persons. Data from 2017 also showed a slight increase in the number of opioid-related deaths, narrowing the gap between alcohol- and opioid-related mortality (Figure 13). However, firm conclusions cannot be drawn as these data are preliminary and subject to change when finalized.

3.4.2 Alcohol-attributable Motor Vehicle Crash Fatalities

During 1994–2016, 630 people died in alcohol-attributable motor vehicle crashes in Alaska, which represented 35% of all motor vehicle fatalities (Figure 14). During 1994–2002, 41% of all motor vehicle crashes in Alaska were alcohol-attributable, while the national average was 31%. During 2003–2016, the average percentage of alcohol-attributable motor vehicle fatalities was 31% in Alaska and the U.S.27 However, in 2016, 36% (30/83) of all motor-vehicle fatalities in Alaska involved a driver with a BAC ≥0.08 g/dL, which is greater than the national percentage of 28% (10,497/37,461).[27]

3.5 Treatment

During fiscal years 2015–2017 in Alaska, there were 32,324 unduplicated treatment admissions for substance abuse. Of those admissions, 44% (14,247) listed alcohol as at least one of the substances being abused. Of these 14,247 admissions, 39% (5,515) were treatment admissions for alcohol only with 71% (3,901) in outpatient treatment, 24% (1,315) in detox facilities, and 13% (706) in residential programs (Table 5). On average over the 3-year period, Alaska Native people and Whites made up 49% (2,720) and 32% (1,756) of the alcohol-only admissions, respectively; males made up 58% (3,209) of the alcohol-only admissions (Table 5).

Since 2015, the total number of substance abuse treatment admissions has remained relatively constant, with an average of 10,775 unduplicated treatment admissions per year (Figure 15). From 2016 to 2017, there was a 14% decrease for alcohol-only treatment admissions; conversely, there was a 6% increase in admissions for alcohol- and drug-related substance abuse. This reflects 281 fewer people being admitted for alcohol-only treatment and 167 more people being admitted for alcohol and drug treatment. The biggest source of the decrease from 2016 to 2017 in alcohol-only treatment came from detox facilities, which showed a 20% decrease in the number of unduplicated admissions during the 2 years (Figure 15).

4.0 Prevention

Prevention is part of an overall continuum of care that comprehensively addresses mental health and substance abuse at multiple points in time. The boundaries between prevention and treatment are often difficult to distinguish as treatment includes preventative aspects in terms of reducing the likelihood and severity of future problems. In order to better identify the contribution of prevention approaches, it is important to come up with definitions for the components that make up the continuum of care model. Building upon framework introduced by the National Academy of Medicine (formerly the Institute of Medicine) in a 1994 report,[36] SAMHSA describes the four components of the continuum of care model as follows:[37]

- Promotion: strategies that create environments and conditions that support behavioral health and the ability of individuals to withstand challenges.

- Prevention: specifically delivered prior to the onset of disorder, these interventions are intended to prevent or reduce the risk of developing a behavioral health problem, such as alcohol misuse.
- Treatment: services for people diagnosed with a substance use or other behavior health disorder.
- Recovery: services that support an individual's ability to live a productive life in the community, often helping with abstinence and reducing morbidity associated with disorder.

The Alaska Department of Health and Social Services supports an array of evidence-based promotion, prevention, and early intervention strategies addressing substance abuse and mental health. The prevention strategies have clearly defined and measurable performance outcomes (e.g., percent of youth consuming alcohol in last 30 days, number of alcohol-attributable school suspensions and expulsions, number of alcohol-attributable citations and arrests). Strategies are categorized and data are collected based on the National Academy of Medicine prevention definitions (Universal, Selected, Indicated), as well as the six Center for Substance Abuse Prevention strategies: 1) Information Dissemination; 2) Education; 3) Alternative Meaningful Activities; 4) Individual Support and Referral; 5) Community-Based Processes; and 6) Environmental Approaches. Currently there are 19 grantees in Alaska funded to implement these strategies and each project is led by a local coalition. Examples of specific alcohol-attributable strategies implemented include reducing retail and social access to alcohol for youth, providing education about alcoholic beverage servings and the harms associated with binge and heavy drinking, increasing visible enforcement of underage drinking laws, and promoting media campaigns to address and combat social norms of alcohol misuse and abuse. Although not every grantee has elected to focus on alcohol-specific outcomes, many are working to build protective factors that impact youth substance abuse over time.

More specific programs funded by the state include the Alaska Alcohol Safety Action Program (ASAP), which provides substance abuse screening and case management of driving while intoxicated (DWI) and other alcohol- and drug-related misdemeanor cases that are referred from the district court. ASAP operates as a neutral link between the justice and health care delivery systems to offer a consistent process to ensure that clients complete required substance abuse education or treatment programs as prescribed by the courts. The benefits include: reduced recidivism; decreased resources spent by prosecutors, law enforcement officers, judges, attorneys, and corrections officers enforcing court-ordered conditions; increased accountability; and increased access to and compliance with treatment.

Another important feature of ASAP is the Juvenile Alcohol Safety Action Program, which receives referrals for children aged <18 years who have three or more minor possession or consuming offenses, or who have a DWI offense. It operates in a similar manner by linking juvenile offenders to substance abuse education and treatment as well as ensuring program completion.

Another alcohol prevention effort was started in 2004 by a multi-disciplinary workgroup called the Alaska Committee to Prevent Underage Drinking (ACPUD). ACPUD prepared a blueprint for a range of science-based state and community actions to reduce underage drinking in Alaska. The plan was intended to be a resource for agencies working at the community level and is based on prevention research and stakeholder input about the issues and capacity for prevention in important sectors (e.g., education, treatment, and law enforcement).[38] The intended users of this document are community-level prevention professionals across the state. The plan focuses on six strategy areas: 1) availability of alcohol, 2) prevention, 3) treatment, 4) coordination, 5) social norms and culture, and 6) research.

The Division of Behavioral Health (DBH) also collects data for the annual Sober Truth on Preventing Underage Drinking Act (STOP Act), which is an initiative to help communities prevent and reduce alcohol use among teens and young adults. DBH organizes and submits these data in reports to Congress to summarize the resources and infrastructure for underage drinking. This information can be used to identify infrastructure gaps and new opportunities for prevention efforts. Programs described in this report include ASAP; the Alcohol Drug Information School, which provides education to first-time DWI and minor consuming offenders; and the PRIME for Life program an evidence-based prevention and intervention program geared toward adolescents and adults aged 14–20 years to help them

learn how to reduce their risk of alcohol and drug-related problems.

Lastly, the newly funded Alaska 4P's Plus project, utilizes an innovative screening methodology that identifies pregnant women at risk for alcohol, tobacco, and illicit drug use, alerting their healthcare provider to the need for additional assessment and monitoring.[39] In January 2017, Alaska 4P's Plus initiated a collaborative surveillance data collection project between the Division of Behavioral Health, the Division of Public Health, clinical care providers, and health care institutions. Using the validated 4P's Plus screening tool, hospitals in Anchorage, Fairbanks, Homer, Juneau and the Mat-Su began screening all pregnant women admitted for delivery for substance use, including alcohol. Mothers who screen positive are offered brief intervention and referral to appropriate treatment. The project conducts training in screening, brief intervention, and referral. While screenings are currently limited to mothers delivering in one of these five communities, the volume of screening was about 10% of all Alaska births for September 2017–December 2017. It is expected that additional hospitals and outpatient providers will join the project in the coming years. The Governor's Council on Disabilities and Special Education has an FASD Workgroup whose strategic plan includes promotion of universal screening using the Alaska 4P's Plus tool and other efforts to prevent alcohol-exposed pregnancies.

Taken together, these programs address the interrelatedness of alcohol-centered prevention with health and wellness concepts, including mental health, violence, and juvenile delinquency. Aligning common concepts of improving health and decreasing risk behaviors will produce a collective impact on the problems these projects seek to address. Because alcohol misuse is interrelated with mental health, suicide, fetal alcohol spectrum disorders, family violence, juvenile delinquency, and many other individual and social problems, broad collaboration across governmental and non-governmental programs and agencies is essential for success in reducing the adverse individual and community impacts of alcohol misuse statewide.

5.0 Discussion

Alcohol misuse has taken a considerable toll on the health and well-being of Alaskans. Alcohol-attributable illnesses and poisonings killed 1,400 persons in Alaska during 2007–2016. Of those deaths, 20% (273) were directly caused by acute-alcohol poisonings. Moreover, on average, 35 people are killed in Alaska each year in motor vehicle crash fatalities involving a driver or motorcycle rider with a BAC ≥0.08 g/dL, further adding to the tally of alcohol-attributable fatalities. By way of context, alcohol has consistently caused more deaths than opioids and methamphetamines combined; however, the average annual number of deaths due to smoking during 2011–2015 was almost five times the number of alcohol-attributable fatalities.[40]

Strikingly apparent in the mortality data presented here was the disproportionately large impact of alcohol on Alaska Native people, who make up about 15% of the Alaska population. In 2016, 75% of all acute-alcohol poisoning deaths in Alaska occurred in Alaska Native people, and the rate of alcohol-attributable mortality among Alaska Native people was over 7 times that of non-Native Alaskans and nearly double that of the Alaska Native/American Indian population nationally.[14]

In addition, alcohol substantially strains our emergency health care services, as demonstrated by the fact that 7.6% of all Alaska EMS transports in 2017 were alcohol-attributable. The majority of alcohol-attributable EMS transports in 2017 involved persons aged 31–60 years (66%) and Alaska Native people (61%). Similarly, of the alcohol-attributable outpatient discharges, 71% were emergency room visits, further suggesting a large burden on our emergency medical services. Nationally, rates of alcohol-related emergency department visits are on the rise, increasing 47% during 2006–2014.[41]

Additionally, in 2016, 39% of patients seen for alcohol-attributable outpatient care in Alaska had more than one alcohol-related discharge. These individuals accounted for nearly 75% of all alcohol-related outpatient discharges. Moreover, the 3% of outpatients that had ≥10 alcohol-attributable outpatient discharges accounted for 21% of total alcohol-attributable outpatient discharges. This indicates that hospital readmissions due to alcohol are high and these individuals likely represent an important target population for intervention efforts.

Furthermore, during 2015–2016, there were 1.6 inpatient and 20.0 outpatient hospital discharges per

1,000 population with a primary diagnosis of an alcohol-related condition in Alaska. Comparable national data from 2000–2014 found a similar rate of inpatient discharges with a primary alcohol-related diagnosis (1.4 per 1,000 population).[42] Unlike the Alaska discharge data, the national data included liver cirrhosis without mention of alcohol in the definition of an alcohol-related diagnosis and did not capture Federal hospitals, rehabilitation hospitals, or hospitals where the average length of stay is 30 days or longer.

Similar to alcohol-attributable mortality data, substantial racial disparities were apparent in the hospital discharge data. During 2015–2016, Alaska Native people experienced over 11 times the rate of alcohol-attributable hospital discharges compared with non-Native Alaskans. Similar to EMS transports, 67% of alcohol-attributable hospital discharges were among Alaska Native people.

Alcohol also remains a leading contributor to the number of injury hospitalizations in Alaska, accounting for an average of 22% of injury hospitalizations from 1991–2015. This has resulted in over 24,700 injury hospitalizations; of which, nearly 5,300 (21%) were suicide or attempted suicide with alcohol involvement. Furthermore, per ATR data, alcohol was involved in 44% of all injury hospitalizations due to suicide or suicide attempt and Alaska Native people made up 59% of all alcohol-involved suicide and suicide attempts. Nationwide, during 2003–2014, AI/AN suicide decedents were more likely to have reportedly used alcohol in the hours before death (adjusted odds ratio = 2.7; 95% CI = 2.4–3.0) and had more than twice the odds of a positive alcohol toxicology result compared to White suicide decedents (adjusted odds ratio = 2.1; 95% CI = 1.9–2.5).[43] Although the relationship between mental health and alcohol abuse is not discussed in detail in this report, suicide is an important public health problem in Alaska and alcohol misuse is a strong risk factor for suicidal behavior.[44]

Alcohol use often begins in early adolescence with the median initiation age of 14.6 years during 2013–2015.[45] In 2015, 15% of Alaska adolescents reported drinking alcohol for the first time before they were 13 years old (the national average for this age is 17%). When looking at excessive alcohol consumption, Healthy Alaskans 2020 set a goal to reduce adolescent binge drinking to 17%. In 2015, 13% of Alaska adolescents reported binge drinking, well below the Healthy Alaskans 2020 goal. This represents an important success.

Since BRFSS data collection started in 1991, over 50% of adults reported consuming alcohol and about 20% of adults reported binge drinking. Males consistently reported higher rates of alcohol consumption and binge drinking. White adults reported the highest rates of drinking, and Alaska Native people reported the highest rates of binge drinking. Similarly, higher percentages of White women reported drinking before and during pregnancy compared to Alaska Native women, but consistently reported lower rates of binge drinking before and during pregnancy. In general, women aged 20–24 years are more likely to binge drink during pregnancy than older women across races and regions. A 2018 study found that Alaskans have the second highest number of annual binges per adult and the fifth highest number of annual binges per binge drinker among U.S. adults.[46] A number of studies have shown a dose-response relationship between alcohol and total mortality, demonstrating that increased drinking can lead to increased mortality.[47,48,49] Moreover, an analysis of 83 prospective studies found that individuals who drink ≤100 grams per week of alcohol (about 5–6 pints of beer per week) are at the lowest risk for all-cause mortality, supporting reductions of alcohol consumption limits in existing U.S. guidelines.[50]

In Alaska, the prevalence of fetal alcohol syndrome (FAS) is estimated to be 1.7 per 1,000 live births. Based on a review of numerous studies estimating the prevalence of FAS using either passive surveillance, clinic-based studies, or active case ascertainment, the available literature points to a prevalence rate of 0.5 to 2 cases per 1,000 births in the United States during the 1980s and 1990s.[51] A more recent study in three states found the overall prevalence of FAS to be 0.3 per 1,000 children aged 7–9 years.[52] Due to differences in data collection methods and in diagnostic procedures, it is difficult to directly compare these rates with Alaska statistics. However, regardless of differing study method approaches, Alaska's prevalence of FAS falls on the upper end of the estimated U.S. FAS prevalence range. In order to prevent FAS, sexually active women of reproductive age should avoid alcohol while trying to become pregnant and during pregnancy, and avoid becoming pregnant if they do not think they can or will stop using alcohol while

pregnant. There is no known safe level of alcohol consumption during pregnancy.

Alcohol use has many societal consequences as well. Alaska had the second highest per capita cost of excessive alcohol consumption in 2010 among the 50 states and District of Columbia, resulting in an estimated $827 million spent on excessive alcohol consumption; of which, $638 million (77%) was a direct result of binge drinking.[7] More recently, a study by the McDowell Group estimated that the cost of alcohol abuse to the Alaska economy in 2015 was $1.84 billion. Productivity losses are the largest component of the annual cost of alcohol abuse, totaling $775 million. Of the cost categories, most costs associated with criminal justice/protective services and public assistance/social services are borne by the public sector.[18]

Alcohol's role in adverse childhood experiences is strikingly apparent in Alaska, as approximately one-third of children living out of the home were removed due to parental alcohol abuse. In the Western region, alcohol was the primary reason for removal in two-thirds of cases and was identified as a problem in over 90% of child removals from the home. Moreover, children whose parents or caregivers use alcohol or drugs are at increased risk for a range of medical problems and psychosocial and behavioral challenges.[53] For example, almost 25% of children of mothers identified with a substance use disorder do not receive routine child care in their first 2 years of life, which puts them at risk for a range of adverse health consequences, including vaccine preventable diseases and delayed diagnosis and treatment of other early childhood illnesses. In addition, research has indicated that children of alcohol or drug-involved parents differ from other children involved with Child Protective Services in that they are often younger, less likely to be subsequently reunified with parents, and more likely to remain in foster care for longer durations.[53]

In Alaska, 26% of substantiated cases of child abuse or neglect with an initial assessment noted alcohol abuse in the household. The co-occurrence of parental alcohol use and child maltreatment has been recognized by state and federal agencies as a growing concern, such that many states have taken into account parental alcohol and drug use in their child protection statutes. In addition, alcohol has been recognized as a main contributor to out-of-home placements, as is the case in Alaska. Victims of child abuse and neglect are also not only at increased subsequent risk for involvement with the juvenile justice and adult correctional systems, but also more likely to have alcohol problems as adults.[53,54,55]

Numerous studies support that excessive drinking is a contributory cause of intimate partner violence (IPV) and sexual assault in much the same way as other contributing causes such as gender roles, anger, and marital functioning.[56,57,58,59] It has been estimated that heavy drinking and alcohol use disorders are among the most robust risk factors for IPV,[60] and approximately 50% of sexual assaults involve alcohol consumption by the perpetrator, victim, or both.[61] Annual estimates for 2010–2012 found that 9% of women in the U.S. and 13% of Alaska women experience an alcohol- or drug-facilitated rape in their lifetime.[59] In 2015, a survey of Alaska women administered by the Alaska Council on Domestic Violence and Sexual Assault found that 50% of respondents have experienced either IPV or sexual violence in their life time and 23% of women experienced at least one alcohol- or drug-involved sexual assault in their lifetime.[62] It has also been shown that alcohol use is more common in severely aggressive versus less aggressive events.[63]

As is demonstrated in this report, alcohol plays an important role in both juvenile and adult crime. Over the last 10 years, nearly one in every five convictions in Alaska was alcohol-attributable. National data on alcohol-attributable arrests, during 2012–2014, show a similar trend as 19% of all arrests nationwide were alcohol-attributable.[64] Drunk driving, one of the most prevalent alcohol-specific offenses in the United States,[65] made up the majority (85%) of alcohol-attributable convictions in Alaska. Looking specifically at juvenile corrections from 2013–2017, 7% of all referrals to the Division of Juvenile Justice were alcohol-attributable, compared to 6% in the U.S. during 2013–2016.[66] Alaska Native youth made up a disproportionate percentage (60%) of these alcohol-attributable referrals, which explains in part why Alaska Native youth are overrepresented in the juvenile justice system.[67,68]

In order to combat the consequences of alcohol use and abuse, we often look to treatment programs and facilities to fix the problem. During 2015–2017, over 14,000 admissions for alcohol abuse treatment were documented, which represented 44% of all admissions for substance abuse treatment. From FY 2016 to FY

2017, there was a 14% decrease in the number of alcohol-only treatment admissions, representing 281 people. However, during that same time period there was a 6% increase in the number of treatment admissions for alcohol *and* drug abuse, indicating that polysubstance abuse may be on the rise and underscoring the fact that alcohol abuse disorders cannot be addressed in isolation. As is the case nationally, it is likely that the discrepancy in the number of individuals who access treatment and the number who need treatment is considerable.[69]

While it is important to work on improving the availability and access to treatment for substance misuse, it is most beneficial and cost-effective to prevent misuse from occurring in the first place. To this end, the Alaska Division of Behavioral Health, their grantees, and several other organizations working on alcohol misuse prevention have focused initiatives on adolescents, engaging schools and community centers as channels to administer various prevention programs that focus on influencing common risk and protective factors that are associated with alcohol misuse. Programs like the Alaska Committee to Prevent Underage Drinking and Town Halls on Underage Drinking allow collaboration between federal, state, and local partners to come up with targeted interventions to meet the needs of the specific community while paying close attention to their youth's distinct circumstances and issues.[70]

Early intervention services are often considered the bridge between prevention and treatment services, as the intervention is often the mechanism to engage people with early signs of substance misuse into treatment.[71] The goal is to align common concepts of improving health and decreasing risk behaviors of Alaskans to produce a collective impact on the problems that their alcohol programs seek to address.

The CDC Prevention Status Report shows that prevention strategies such as increasing alcohol taxes, regulating alcohol outlet density, and promoting commercial host liability may be underutilized by states relative to their potential effectiveness.[72,73] In 2002, the Alaska Legislature approved the biggest alcohol tax increase in state history with the hope that the added cost would reduce alcohol consumption. A study of this tax hike indicated that the alcohol tax increase was passed through to beverage prices across most popular brands of beer, wine, and spirits.[74] Furthermore, reductions in alcohol-related mortality were observed immediately following the 2002 alcohol tax increases in Alaska.[75] This finding was consistent with a previous Alaska alcohol tax increase in 1983, which also saw decreased deaths caused by alcohol-related disease.[75] While these findings indicate that taxing alcoholic beverages can be an effective public health strategy for reducing the burden of alcohol-related disease, it should be noted that despite the tax increase in 2002, the consumption of most alcohol beverages has continued to increase.[76]

Lastly, Alaska's local option laws offer unique opportunities for communities to alter alcohol access and availability. In fact, a number of studies have credited Alaska's local option laws with reducing injury morbidity and mortality and improving public safety.[77,78,79,80] For example, one study looking at age-adjusted rates of serious injury in Alaska Native villages during 1991–2001 found a statistically significant increased risk of injury from assault, motor vehicle collision, and other causes in wet villages compared to dry villages (rate ratios of 1.5, 1.4, and 1.2, respectively).[80] An additional study in Barrow found that banning the sale, importation, and possession of alcohol resulted in fewer alcohol-related outpatient hospital visits.[78] However, it should be noted that the age-adjusted injury rate from assault, self-harm, and motor vehicle collisions in either dry or wet villages exceeded those of the state as a whole.[80] Similarly, a Canadian study found dry communities to have higher rates of violence and assault compared to national averages; yet, overall sexual assault, serious assault, and homicide rates were 1.48, 2.10, and 2.88 times higher in wet vs. dry communities, respectively.[81] The unacceptably high levels of injury even in villages where the local option of alcohol prohibition is exercised warrants more attention on other contributory factors, such as limited police presence and availability of mental health services.

6.0 Limitations

BRFSS, YRBS, and PRAMS data on alcohol use are limited in that the surveys rely on adults, high school students, and women (teens and non-teens) who recently delivered a live-born infant, respectively, reporting truthfully on their use of an illegal or harmful substance. While survey responses are de-identified, respondents may not feel comfortable admitting to past or current alcohol use, resulting in underreporting. In addition the YRBS survey collects data only on youth currently enrolled in school.

The Office of Children's Services reported the number of children removed from their home due to parental alcohol abuse is likely underestimated due to the high probability that alcohol plays a substantial role in other removal reasons including drug use, domestic violence, and child abuse, but is not listed as the primary reason for removal. In addition, it is possible that an IA may not capture the full extent of alcohol use in the household during an investigation, further underestimating alcohol's role in child neglect and abuse.

The Alaska Department of Corrections reports alcohol-attributable bookings and convictions by offense and not offender. Therefore, if an offender is booked or convicted for multiple offenses, each offense is counted. The number of convictions reported here may not represent the number of unique offenders, but rather the burden of alcohol misuse on the court system.

Similar to the Alaska DOC, the Division of Juvenile Justice reports on the number of referrals and charges involving juveniles. If a juvenile is referred multiple times within the year, each referral will be counted separately. Therefore, the number of referrals is not representative of the number of unique offenders in a given year, but rather can help describe the burden of underage alcohol use on the court system.

The number of suspensions reported by the Alaska Department of Education and Early Development may not represent unique students as it is possible that one student could be suspended more than once in given school year.

In 2011, the Alaska Trauma Registry no longer included poisonings among adults due to intentional, self-inflicted, or suicidal overdoses on alcohol. Only work-related and inhalation poisonings were still included. This change makes it difficult to compare injury hospitalizations pre- and post-2011. Patient criteria for children aged <18 years were not amended; all hospitalizations of children due to poisoning continued to be entered without interruption.

Alaska EMS transports are limited in that no patient information is available after the patient arrives at the hospital. As a result, toxicology testing on patients is not available and suspected alcohol use must be derived from patient, bystander, and law enforcement accounts. Additionally, it is difficult to track patients and therefore the same individuals may be involved in multiple EMS transports, skewing the demographic information presented here. Lastly, the reported numbers of alcohol-attributable transports are likely an underrepresentation of the total EMS transports where alcohol was involved due to the subjectivity of primary and secondary impressions. There may be cases where a patient is transported to the hospital due to a sustained injury that was caused by alcohol intoxication, but was listed as another injury cause.

The Health Facilities Data Reporting Program relies on ICD-9-CM and ICD-10-CM codes to describe patient injury and disease. ICD-9-CM codes were used prior to October 2015, after which the program switched over to ICD-10-CM. Alcohol-attributable ICD codes were chosen based on CDC's classification of chronic and acute injury causes that are 100% attributable to alcohol. While these codes represent the most reliable estimate of alcohol morbidity, they fail to capture the role that alcohol might play in hospitalizations of other underlying causes. Finally, the dataset is limited in that it does not include hospital records from Southeast Alaska Regional Health Corporation, PeaceHealth Ketchikan, or military hospitals in Alaska, as these data were not available at the time of this report.

As previously mentioned, limitations in diagnosis and subsequent ICD-CM coding practices of FASD limits the ABDR to presenting estimates of FAS prevalence only.

Death certificates use ICD-9 and ICD-10 codes to describe the underlying causes of death among decedents. Because of the increases in reporting specificity, it is impossible to say whether the rise in alcohol mortality rates displayed here is the result of an increase in alcohol-attributable deaths or an increase in reporting over time, or both. Finally, alcohol-attributable deaths not resulting from acute poisonings may be underestimated here, as alcohol-attributable mortality likely extends beyond the information listed on death certificates. For instance, for fatalities resulting from motor vehicle accidents, suicide, or domestic violence, the death certificate would not indicate whether the outcome was the result of an intoxicated individual, making it impossible to attribute these deaths to alcohol. Additionally, medical examiners generally do not perform toxicology testing beyond what is needed to determine cause and manner of death, meaning that the role of alcohol in a death would go unnoticed if there is not a strong suspicion of its involvement to encourage that testing be performed. As a result, the 3,526 deaths are likely an

underestimate of Alaska's total alcohol mortality over the time period examined.

The year-to-year variation in the group of substance abuse treatment agencies and modalities that receive funding from the Division of Behavioral Health treatment and recovery grant makes it difficult to compare treatment admissions across years. For instance, grantees may opt to forego funding in certain years so that they no longer have to comply with the grantee reporting requirements. A list of treatment agencies can be found in the Appendix. Additionally, the number of beds available in all treatment settings (residential, detox, outpatient etc.) may be a limiting factor to the number of treatment admissions for alcohol. Furthermore, some populations, like pregnant women and injection drug users, take priority and therefore individuals seeing assistance with alcohol addiction may be bumped down the waiting list.

Lastly, information on the race and ethnicity of patients may not be systematically or accurately collected in all datasets.[82,83,84] AI/AN people are frequently misclassified in surveillance and administrative data systems and have the lowest level of agreement between self-reported race and race assigned in medical records compared to other race groups.[83,84] Therefore, caution should be used when interpreting disparities between racial groupings due to the potential for misclassification. Research is needed to better understand the magnitude and direction of this potential source of bias.

7.0 Conclusion

Perpetually present in the shadows of newly emerging public health concerns, including recent epidemics involving opioids and other drugs of abuse, alcohol misuse and its extensive adverse consequences to individuals, families, and communities often gets overlooked. By way of perspective, on average since 2010, twice as many people have died from alcohol-attributable causes each year as have died from methamphetamines and opioids combined. However, unlike these other substances of abuse, alcohol mortality rates have seen less drastic increases and have contributed less to premature death statistics. The acuteness and novelty of the opioid epidemic contrasted with the endemic and enduring nature of alcohol has contributed to increased attention on opioid prevention and treatment, while problems with alcohol persist, often in combination with other drugs of abuse.

The epidemiologic data presented here illustrate that the long-standing problem of alcohol misuse continues to plague Alaskans resulting high rates of morbidity, mortality, and adverse social consequences. While alcohol misuse affects all genders, races, regions, and age-groups, Alaska Native people are disproportionately impacted, accounting for two-thirds of all alcohol-attributable hospitalizations and half of all alcohol-attributable deaths in Alaska.

In light of the current opioid epidemic and the resurgence of other drugs of abuse and associated poly-substance misuse, it is important to strengthen partnership between all agencies and organizations in Alaska that work to address substance abuse and mental health issues.

Finally, although thousands of Alaskans undergo treatment for alcohol abuse annually, this typically only occurs after a person has struggled with alcohol use disorder for many years. This underscores the importance of allocating sufficient resources to prevent the problem from developing in the first place by further reducing alcohol misuse among teens and young adults, who are particularly vulnerable to alcohol use disorder. Moreover, we must provide sufficient support for early intervention and treatment programs to meet the considerable demand for these resources.

8.0 Appendix

Table 1. Trends in Ethanol Consumption in Gallons per Capita, by Alcoholic Beverage and Year — AEDS Alaska, 2007–2015

	Alaska									U.S.	U.S.
Beverage Type	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2014**	**2015**
Spirits	0.96	1.09	1.16	1.25	1.17	1.13	1.16	1.16	1.20	0.80	0.81
Wine	0.44	0.49	0.54	0.55	0.54	0.53	0.52	0.52	0.53	0.43	0.42
Beer	1.13	1.20	1.32	1.23	1.15	1.17	1.07	1.11	1.11	1.09	1.09
Total	2.53	2.78	3.02	3.03	2.86	2.83	2.75	2.79	2.84	2.32	2.32

Figure 1. Trends in Ethanol Consumption in Gallons per Capita, by Spirits and All Alcoholic Beverages — AEDS Alaska, 2007–2015

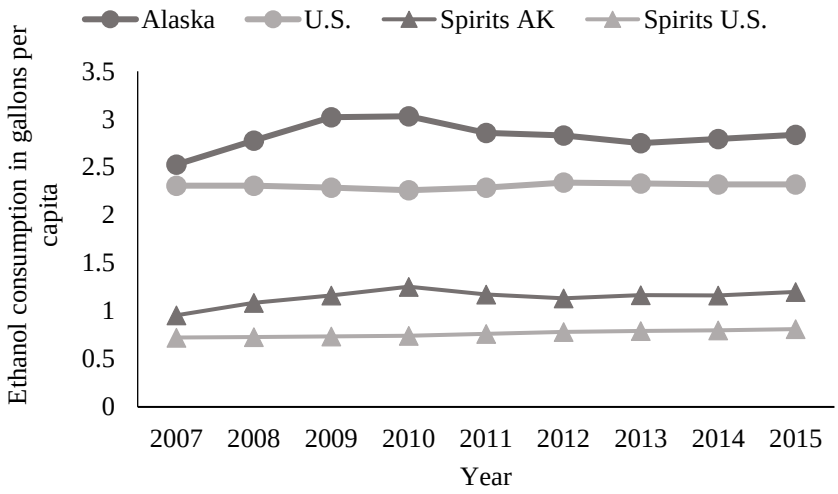


Figure 2. Type of Alcohol Restriction in Local Option Communities, Alaska, 2016 (N=109)

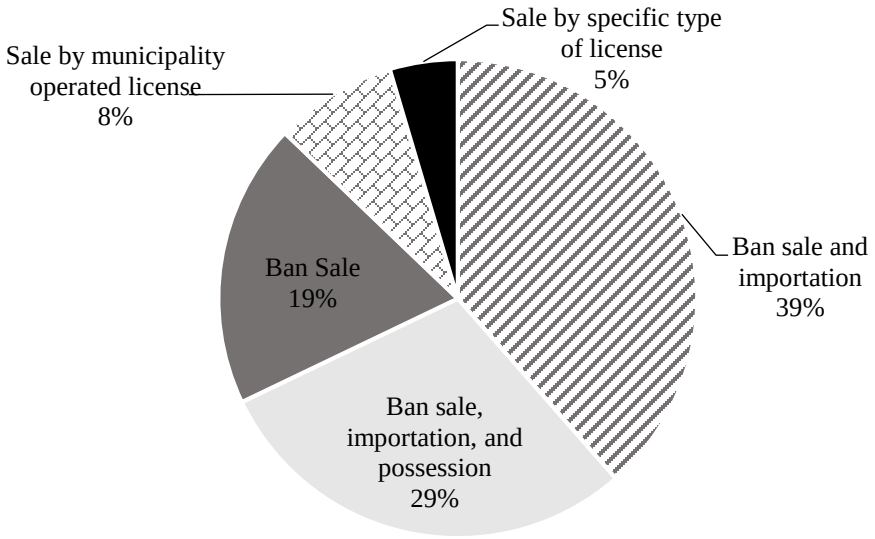
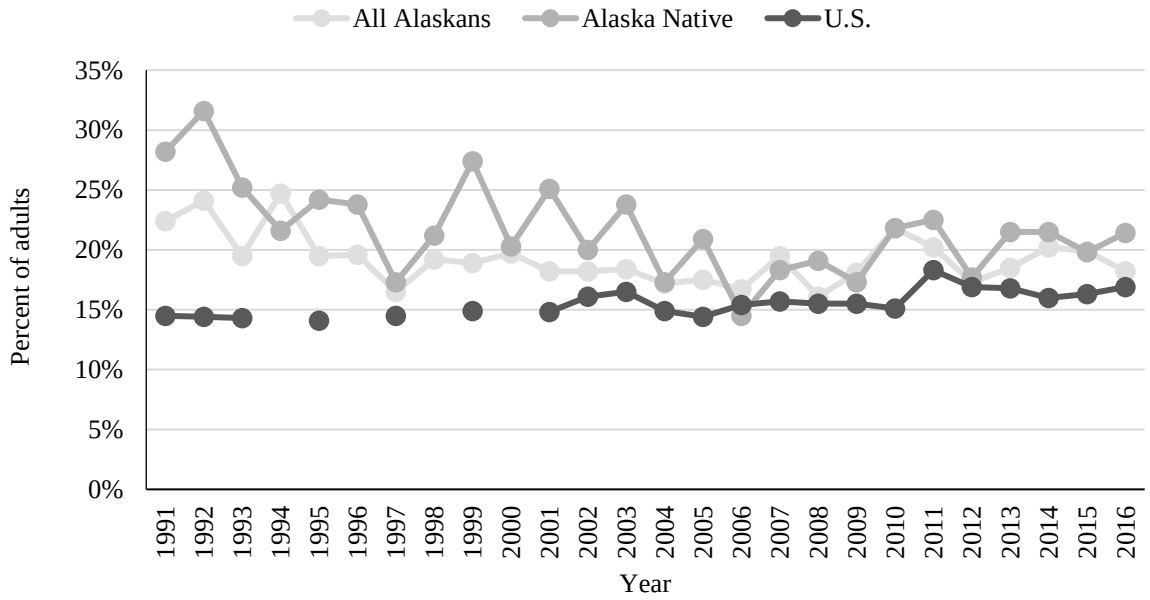
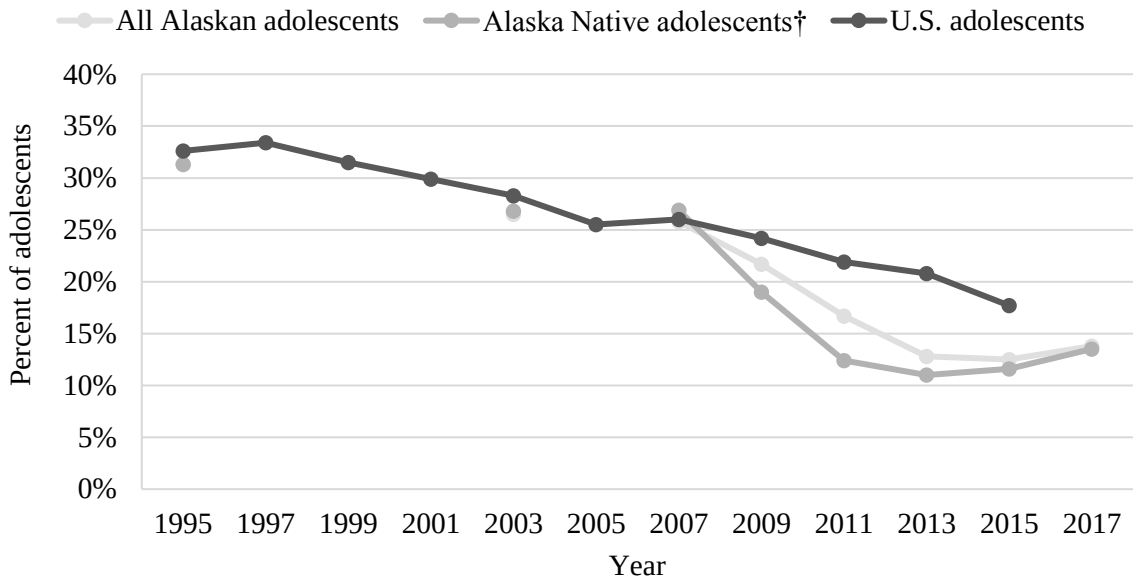


Figure 3. Percentage of Adults (18+) Who Reported Binge Drinking in the Past 30 Days — Alaska BRFSS, 1991–2016*



**In 2006, the definition of binge changed for females from ≥5 drinks to ≥4 drinks on an occasion, but remained the same for males.*

Figure 4. Percentage of Students in Grades 9–12 in Traditional High Schools Who Reported Binge Drinking in the Past 30 Days — Alaska YRBS, 1995–2017*



**In 2017, the definition of binge changed for females from ≥5 drinks to ≥4 drinks in a row within a couple of hours, but remained the same for males.*

†In 1995 and 2003, the AI/AN definition was Alaska Native or American Indian alone or in combination with another race with known or unknown ethnicity. In 2007–2017, the definition for AI/AN was Alaska Native or American Indian alone or in combination with another race with known ethnicity.

Figure 5. Percentage of Women Who Reported Alcohol Use 3 Months before Pregnancy and During the Last 3 Months of Pregnancy, by Race — Alaska PRAMS, 2009–2015

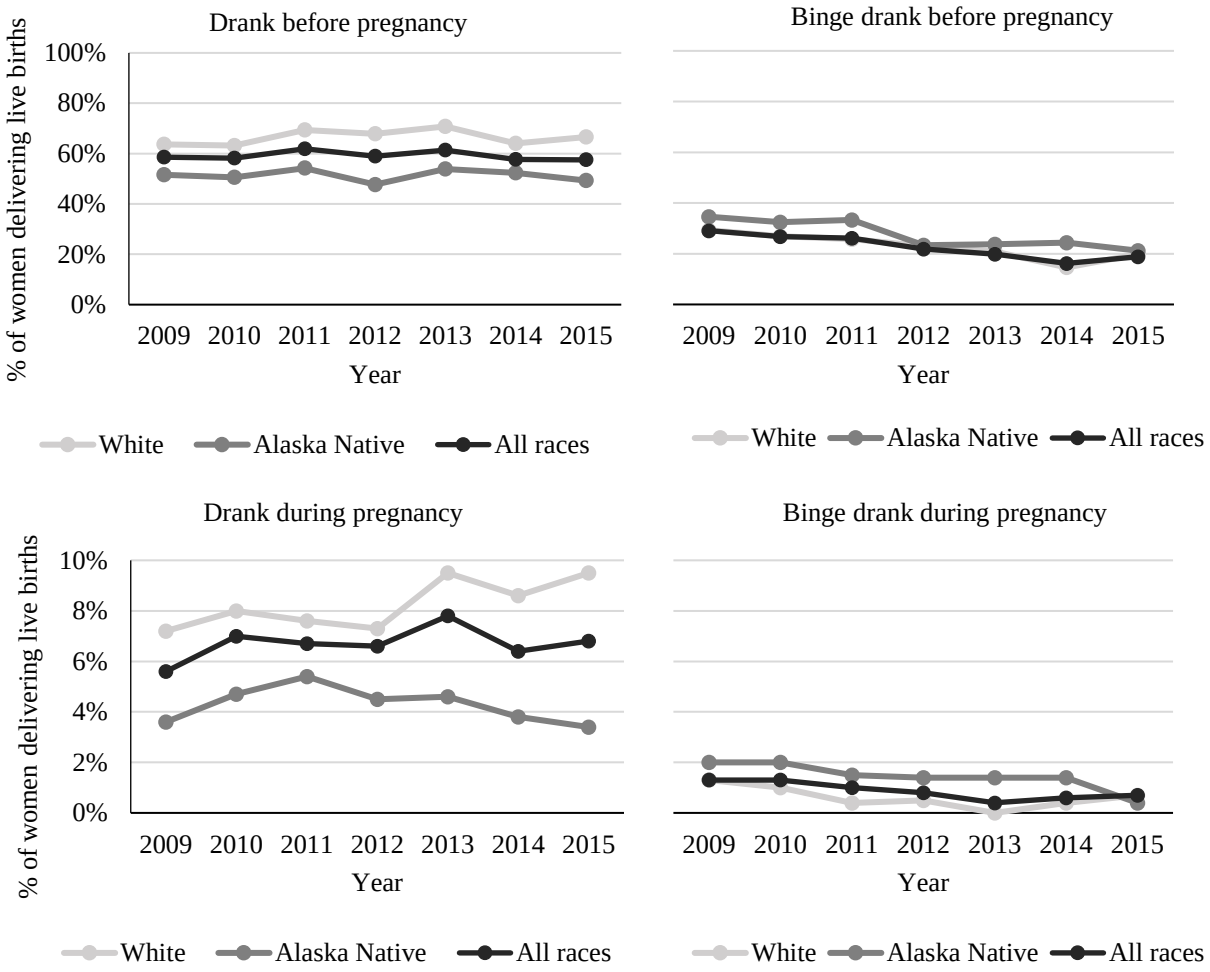


Table 2. Average Percentage of Women Who Reported Alcohol Use and Binge Drinking 3 Months Before Pregnancy and During the Last 3 Months of Pregnancy, by Selected Demographics — Alaska PRAMS, 2009–2015

	3 months before pregnancy		Last 3 months of pregnancy	
	Any alcohol	Binge	Any alcohol	Binge
Maternal Race				
Overall	59.2%	22.8%	6.6%	0.9%
White	66.5%	23.1%	8.2%	0.6%
Alaska Native	51.4%	27.6%	4.3%	1.5%
Region				
Anchorage	61.2%	21.8%	7.6%	0.8%
Mat-Su	60.1%	19.9%	6.9%	0.3%
Gulf Coast	61.2%	23.5%	7.7%	0.6%
Interior	64.0%	25.0%	6.7%	1.0%
Northern	43.5%	25.2%	4.2%	2.6%
Southeast	68.7%	28.2%	5.8%	0.6%
Southwest	36.3%	19.3%	3.6%	1.3%
Maternal Age Group				
≤ 17 years	24.1%	16.9%	0.2%	0.0%
18–19 years	39.9%	23.9%	3.4%	0.7%
20–24 years	59.3%	28.1%	3.6%	1.5%
25–29 years	62.5%	23.0%	6.5%	0.5%
30–34 years	62.7%	21.0%	9.6%	0.9%
35–39 years	62.7%	16.9%	12.0%	0.8%
≥40 years	45.8%	5.8%	4.7%	0.2%

Table 3. Characteristics of Alcohol-attributable Alaska EMS Transports — Alaska, 2017 (N=2,624)

Sex	Count	%
Male	1,435	55
Female	1,164	44
Blank	25	1
Race	**Count**	**%**
Alaska Native people	1,594	61
White	353	13
African American	31	1
Native Hawaiian or Other Pacific Islander	7	<1
Asian	4	<1
Other	36	1
Unknown	563	21
Age group (years)	**Count**	**%**
0–10	3	<1
11–20	91	3
21–30	530	20
31–40	649	25
41–50	499	19
51–60	584	22
61–70	191	7
71–80	42	2
81–90	5	<1
91–100	0	0
Unknown	30	1
Impression	**Count**	**%**
Primary	1,716	65
Secondary	908	35

Figure 6. Percentage of Children Living Out of Home on July 19, 2017 with a Removal Reason of Parental Alcohol Abuse, by OCS Service Region — Alaska OCS, 2017 (N=1,010)

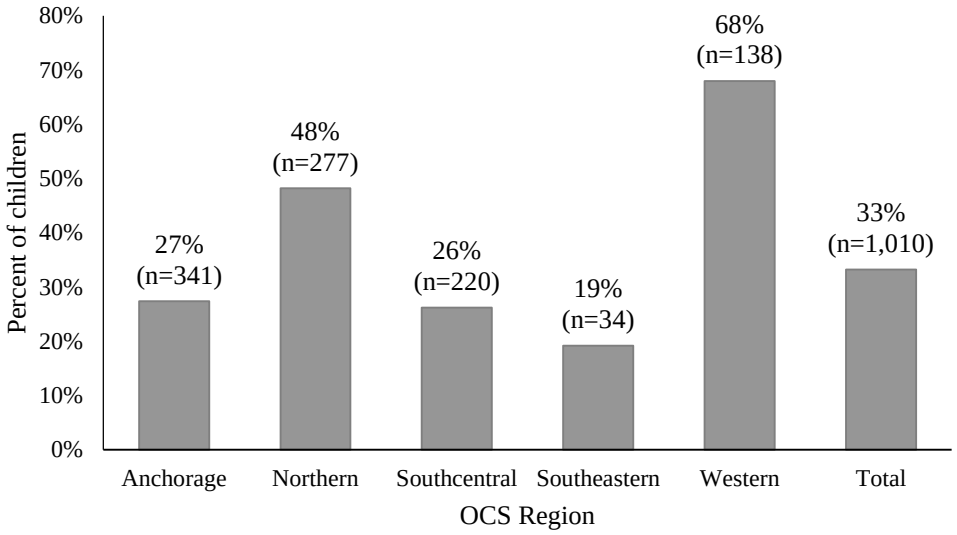
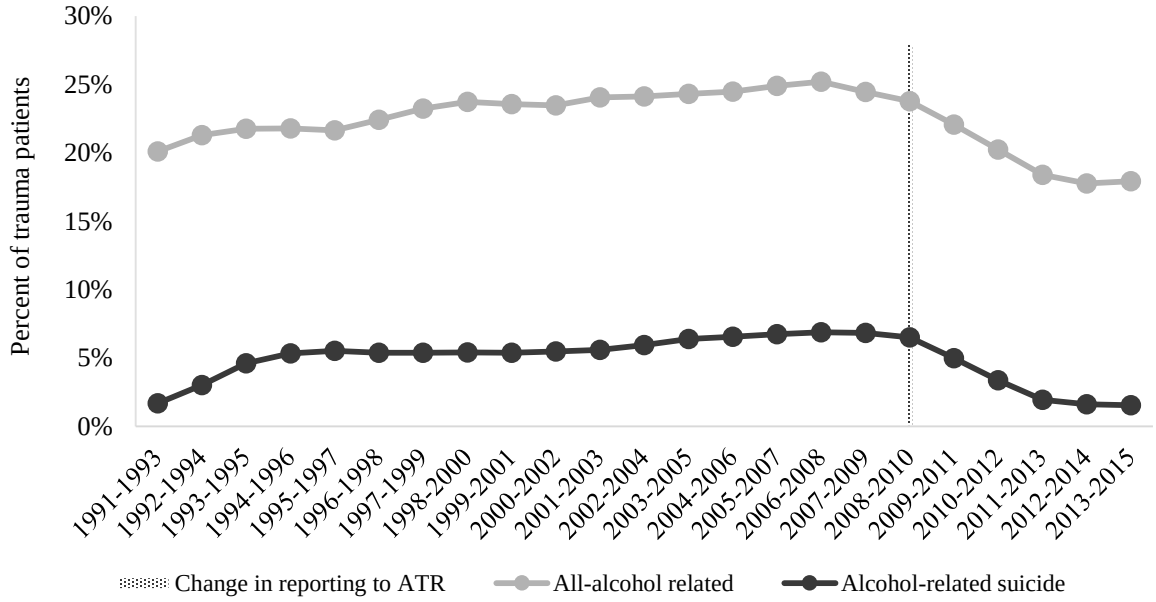
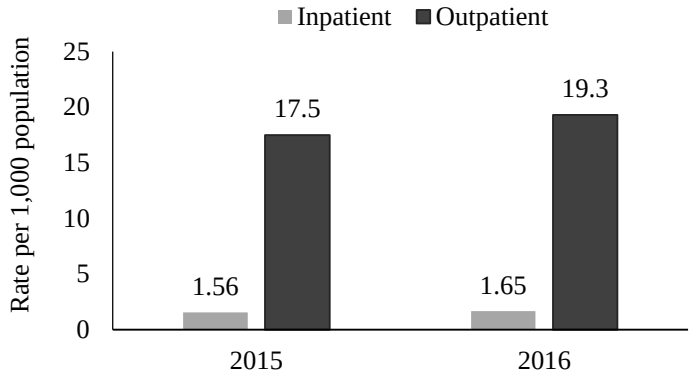


Figure 7. Alcohol-attributable Injury Hospitalizations as a Percent of Total Injury Hospitalizations, by 3-year Moving Average — ATR Alaska, 1991–2015* (N=24,770)†



** Beginning in 2011, hospitalizations for intentional and unintentional poisonings among persons aged 18 years and older were no longer collected and entered into the ATR.*
†Five patients did not have a year identified for their hospital admission.

Figure 8. Rates of Alcohol-attributable Hospital Care — HFDR Alaska 2015–2016* (N= 29,523)



**Data for 2016 are preliminary and subject to change when finalized*

Table 4. Demographic Characteristics of Alcohol-attributable Hospital Care — HFDR Alaska, 2015–2016

Demographic	Rate per 1,000 Discharges (count, %)
Encounter Type	
Total	20.0 (29,523)
Inpatient	1.6 (2,368, 8%)
Outpatient (includes ED)	18.3 (27,155, 92%)
ED	13.0 (19,232, 66%)
Race	
Alaska Native people	88.2 (19,892, 67%)
non-Native Alaskans	7.7 (9,631, 33%)
Sex	
Male	22.3 (17,071, 58%)
Female	17.5 (12,451, 42%)

Figure 9. Prevalence per 1,000 Live Births of FAS, by 3-year Moving Averages, with 95% Confidence Interval — ABDR, 2007–2013 (N=134)

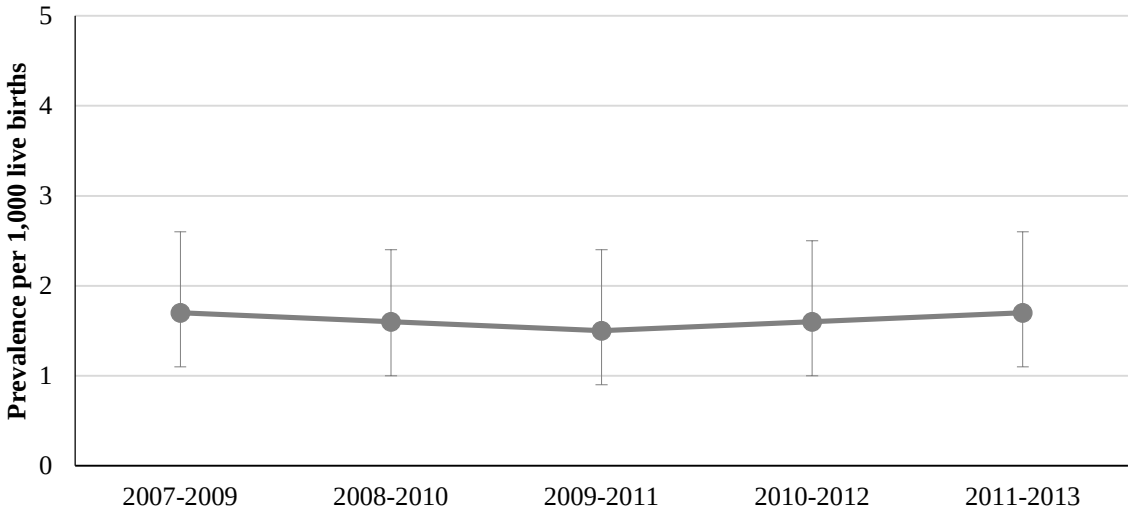
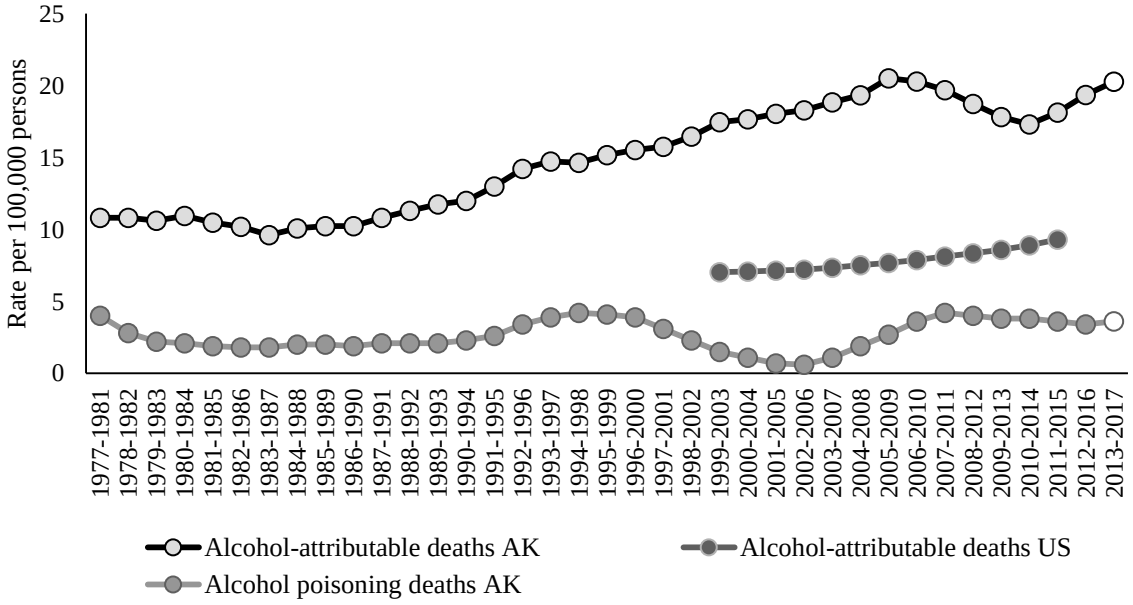
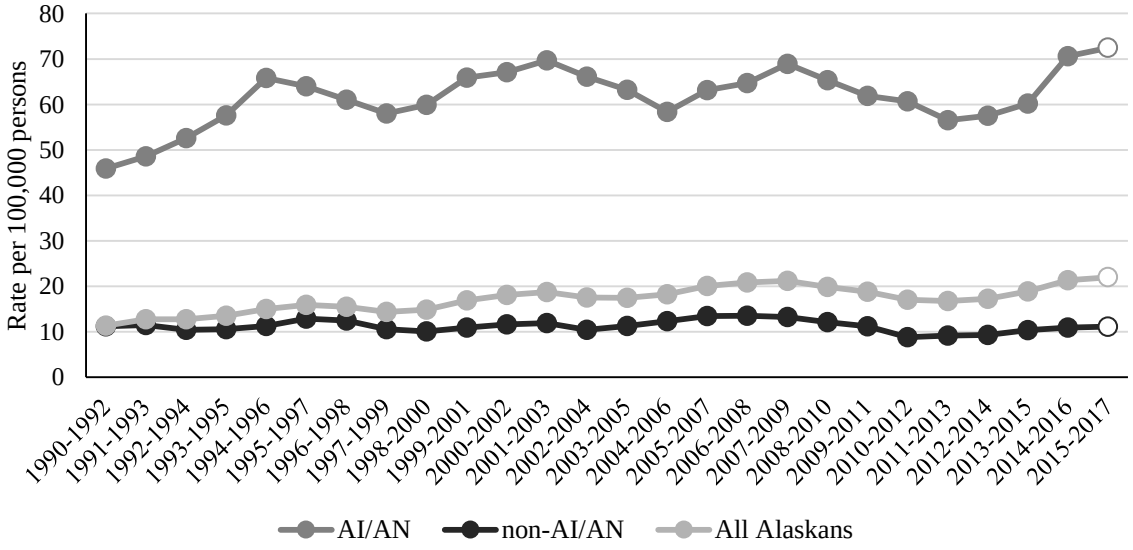


Figure 10. Crude Rates* of Alcohol-attributable Mortality Occurrence in Alaska, by 5-year Moving Averages (1977–2017, n=3,853), Compared with the United States (1999–2015)[14]— Alaska Vital Statistics, 1977–2017† (N=3,853)



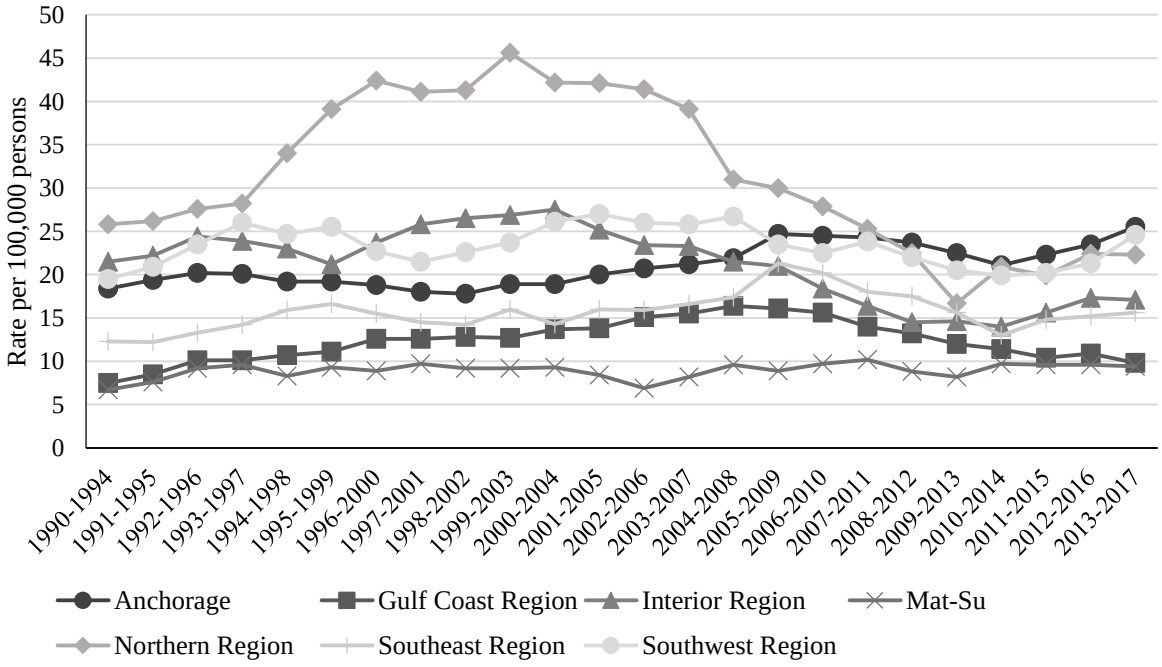
**Crude rates were used to compare rate of alcohol-attributable deaths in 1977–2016 because age-adjusted rates were not available for 1977–1989.*
†2017 data are preliminary and subject to change.

Figure 11. Age-Adjusted Rates of Alcohol-attributable Mortality Occurrence in Alaska, by 3-year Moving Averages and Race — Alaska Vital Statistics, 1990–2017* (N=3,041)



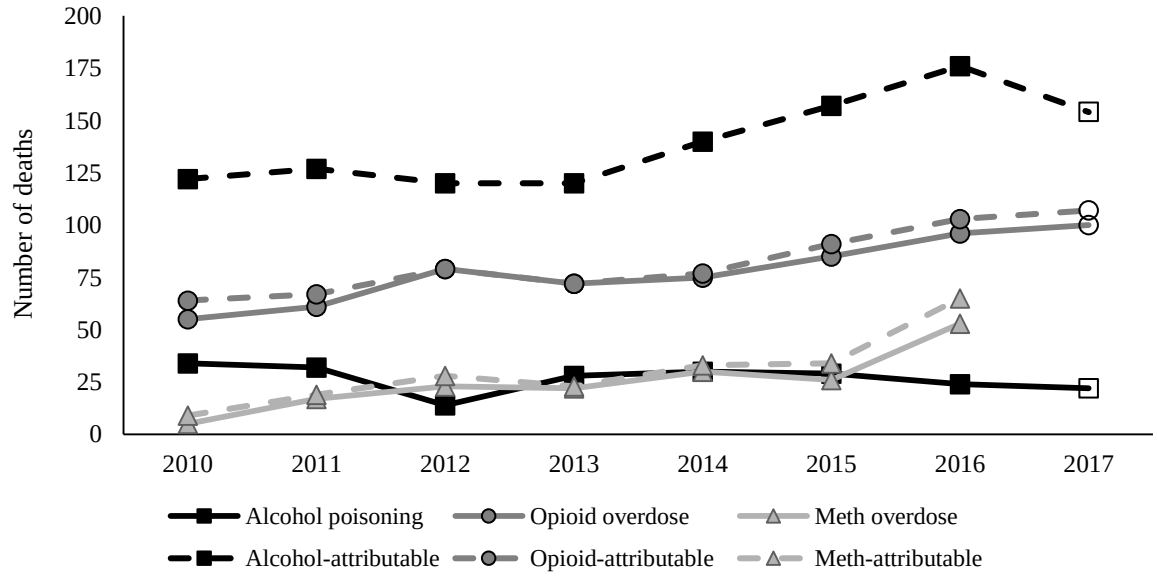
**2017 data are preliminary and subject to change.*

Figure 12. Age-Adjusted Rates of Alcohol-attributable Mortality Occurrence in Alaska, by Public Health Region and 5-year Moving Averages — Alaska Vital Statistics 1990–2017* (N=3,041)



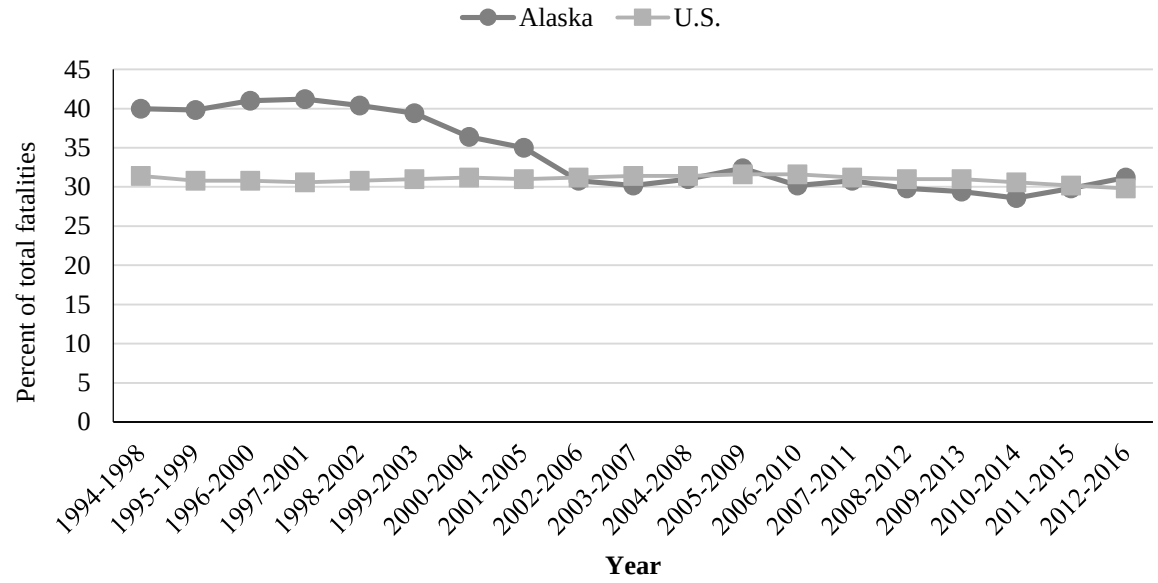
**2017 data are preliminary and subject to change.*

Figure 13. Number of Substance Abuse-Attributable Deaths in Alaska, by Substance* and Year — Alaska Vital Statistics 2010–2017† (N=2,009)



**ICD-10 codes for alcohol-, opioid-, and meth-attributable deaths can be found in the appendix.*
†2017 data are preliminary and subject to change.

Figure 14. Percentage of Total Driving Fatalities Attributed to a Driver with a Blood Alcohol Concentration ≥0.08 (g/dL), by 5-year Moving Averages — FARS, 1994–2015 (N=267,671)*

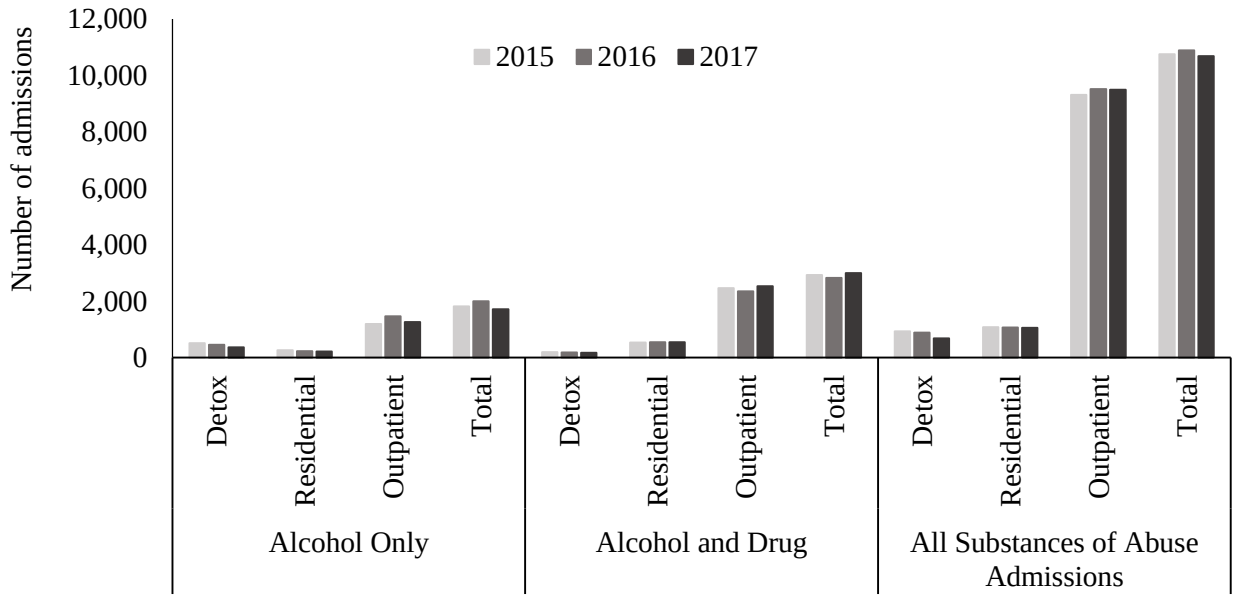


**All alcohol-impaired driving fatalities involved a driver or motorcycle rider with a BAC of ≥0.08 (g/dL).*

Table 5. Demographic Characteristics of Treatment Admissions for Alcohol Only, by Service Type — Alaska AKAIMS, 2015–2017 (N=5,515)

Demographic	Alcohol Only Admissions			
	Total Admitted % (N=5,515)	Detox % (N=1,315)	Residential % (N=706)	Outpatient % (N=3,901)
Gender				
Male	58.2 (3,209)	(818)	(384)	(2,252)
Female	41.8 (2,306)	(497)	(322)	(1,649)
Race				
Alaska Native people	49.3 (2,720)	52.8 (694)	56.8 (401)	46.9 (1,831)
White	31.8 (1,756)	32.0 (421)	25.1 (177)	32.9 (1,284)
Black	1.4 (78)	<1 (11)	<1 (7)	1.5 (60)
Asian	<1 (27)	<1 (1)	<1 (1)	<1 (25)
Native Hawaiian/PI	<1 (34)	<1 (5)	0 (0)	<1 (32)
Multi-race	13.5 (742)	11.7 (154)	14.7 (104)	14.0 (548)

Figure 15. Number of Admissions for Alcohol Only, Both Alcohol and Drug, and All Substances of Abuse Treatment, by Year and Service Type — Alaska AKAIMS, 2015–2017 (N=32,324)



Note: Each admission could include enrollment in more than one service type and therefore the sum of service types for each year often exceeds the total number of admissions for that year.

Health Facilities Data Reporting Program (HFDR) Alcohol-Attributable Hospital Discharge Query Codes

ICD 9 Codes: 291, 305.0–305.0X, 303.0–303X, 790.3, E860–E860X, 980.0, 980.1, E950–E959, 535.3–535.31, 571.0–571.3, 425.5, 357.5, 760.71, 655.4

ICD 10 Codes: F10–F10X, G31.2, G62.1, G72.1, I42.6, K2920–K2921, K70–K70X, K85.2, K86.0, R78.0, X45–X45X, X65–X65X,Y15–Y15X, E24.4, Y90, O99310–O99315, O35.4, P04.3, Q86.0, T51.0, T51.1, T51.9

Alaska Vital Statistics Query Codes and Text Searches

Drug overdose deaths were those defined by ICD-10 codes for unintentional drug poisoning (X40–44), suicide drug poisoning (X60–64), homicide drug poisoning (X85), or drug poisoning of undetermined intent (Y10–Y14)

Alcohol

- Alcohol-attributable deaths: E24.4, F10.0–F10.X, G31.2, G62.1, G72.1, I42.6, K29.2, K70–K70.4, K70.9, K86.0, K85, R78.0, X45m Y15, X65.
- Alcohol poisoning deaths: X45, Y15, X65
- For years prior to 2000, equivalent ICD-9 codes were used to isolate alcohol-attributable and acute-alcohol deaths (i.e. 291, 303, 305.0, 357.5, 425.5, 535.3, 571.0–571.3, 790.3, and 980–980.X).

Opioids

- Opioid-attributable deaths: ICD-10 codes T400–T404, T406 with or without the underlying cause of death defined by ICD-10 codes X40–44, X60–64, X85, Y10–Y14
- Opioid overdose deaths: Only include deaths defined by ICD-10 codes T400-T404, T406 with underlying cause of death defined by ICD-10 codes X40–44, X60–64, X85, Y10–Y14
- Opium (T40.0), heroin (T40.1), natural or semi-synthetic opioids (T40.2), methadone (T40.3), synthetic opioids other than methadone (T40.4), or other unspecified narcotics (T40.6). Prescription opioids were also categorized (T40.2–T40.4).

Methamphetamine

- Methamphetamine-attributable deaths: any death with the word METHAMPHETAMINE listed on text literal fields of the death certificate
- Methamphetamine overdose deaths: Only include deaths defined by ICD-10 codes T436 and/or the word METHAMPHETAMINE listed on the death certificate with underlying cause of death defined by ICD-10 codes X40–44, X60–64, X85, Y10–Y14

Alcohol Treatment Agencies that Report to Alaska's Automated Information Management System

Access Alaska, Akeela Inc., Alaska Addiction Rehabilitation Services, Alaska Child & Family, Alaska Family Services, Alaska Island Community Services, Aleutian/Pribilof Islands Association Inc., Anchorage Community Mental Health Services, Assets Inc., Birchwood Behavioral Health, Boys and Girls Home of Alaska, Bristol Bay Area Health Corporation, Catholic Community Service, Central Peninsula General Hospital, CHOICES Inc., Chugachmiut, Inc., Co-Occurring Disorders Institute, Community Connections, Cook Inlet Council on Alcohol and Drug Abuse, Cook Inlet Tribal Council, Copper River Native Association, Cordova Community Medical Clinic, Council of Athabascan Tribal Governments, Daybreak Inc., Denali Family Services, Eastern Aleutian Tribes Inc, Fairbanks Community Behavioral Health Center, Fairbanks Community Mental Health Center, Fairbanks Community Mental Health Services, Fairbanks Native Association, Family Centered Services of Alaska, Frontier Community Services, Gastineau Human Services, Gateway Center For Human Services, Hope Community

Resources Inc., Interior AIDS Association, Juneau Alliance for Mental Health Inc, Juneau Youth Services, Kenai Peninsula Care Center, Kenaitze Indian Tribe, Ketchikan Indian Community, Kodiak Area Native Association, Lynn Canal Human Resources, Maniilaq Behavioral Health, Mat-Su Health Services Inc., Narcotic Drug Treatment Center Inc., National Council on Alcoholism and Drug Dependence, Nome Community Center, North Slope Borough DHSS, Norton Sound Health Corporation, Peninsula Community Health Services of Alaska, Petersburg Mental Health Services, Polaris House, Presbyterian Hospitality House, Providence Anchorage CRC, Providence Kodiak Island Counseling Center, Providence Valdez Counseling Center, Railbelt Mental Health & Addictions, Rainforest Recovery Center, Residential Youth Care Inc., RurAL CAP Inc., S.E.A.R.H.C., Salvation Army Clitheroe Center, Seaview Community Services, Set Free Alaska, Sitka Counseling and Prevention Services, South Peninsula Behavioral Health Services Inc., Southcentral Foundation - Behavioral Services Division, Tanana Chiefs Conference, TCC-FNA, The Arc of Anchorage, Tok Area Counseling Center, Volunteers of America, Alaska, Wil la mootk Counseling Center, Youth Advocates of Sitka, Yukon-Kuskokwim Health Corporation.

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