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Family Health Dataline

In This Issue: Two Articles on Infant Mortality in Alaska

IN THIS ARTICLE:

- The Back to Sleep campaign encouraging caretakers to put infants to sleep on their backs was initiated in Alaska during 1996. Concurrent with this campaign, rates of sudden infant death syndrome or asphyxia of unknown etiology (together known as "SUDS") declined 45% from 1992-96 to 1997.
- Only two percent of SUDS deaths occurred to infants who slept alone in a crib and in the supine position.
- Among 43 infants who died while sleeping with a parent, 88 % slept with a parent who used alcohol, cigarettes, or illicit substances; only one infant was identified who slept supine with an unimpaired parent on a standard non-water mattress.
- The cause specific infant mortality rate for abuse and neglect related deaths declined each year of the study period until 1997 when it climbed to the highest level of any year examined.
- The AMIMR committee judged that 47 % of Alaska Native and 24 % of non-Native infant deaths were preventable, given the current state of medical knowledge.

Findings of the Alaska Maternal-Infant Mortality Review, 1999

Introduction

Infant mortality is declining in Alaska (Figure 6, pg. 8). The neonatal infant mortality rate for Alaska (deaths between birth and 27 days of age per 1,000 live births) is now lower than the neonatal mortality rate for the U.S. and meets the national Healthy People 2000 target. Post-neonatal mortality (deaths between 28 days and one year) has historically been high in Alaska and Alaska's overall and post-neonatal mortality rates remain higher than the U.S. rates. Postneonatal death is generally associated with the infant's social and physical environment, rather than events surrounding delivery and the prenatal period. The Alaska Maternal Infant Mortality Review (AMIMR) seeks to lower the incidence of infant death through committee review of infant death records.

Infant Mortality in Alaska & US
(per 1,000 live births)

	1995-1997 AK	1997 US	2000 Target
IMR*	7.5	7.1	7.0
NIMR**	3.9	4.7	4.5
PNIMR***	3.6	2.4	2.5

*IMR=Infant Mortality Rate
**NIMR=Neonatal Infant Mortality Rate
***PNIMR=Post Neonatal Infant Mortality Rate

Methodology

Previous issues of the *Dataline* have described in detail the AMIMR process. Briefly, the Section of Maternal, Child, and Family Health, Alaska Division of Public Health attempts to acquire a standard set of information for each infant death that occurs in Alaska. This information is collected from infant and maternal medical records and birth and death certificates for all infants and, for some infants, autopsy reports, police reports, and home interviews. Infant death is defined as the death of an infant before his or her first birthday. Once each month, two to four members of the AMIMR Committee review eight to 12 infant deaths and identify the most likely underlying and contributing causes of death, whether the death was potentially preventable and potential factors that would have altered the outcome. Once each year the entire AMIMR Committee reviews the findings of the previous year and arrives at consensus recommendations based on these findings. For the current review, the AMIMR committee considered aggregate data for the years 1992-97. Because 97 % of the known infant deaths that occurred during this period had been reviewed, this allowed collection of cause specific infant mortality rates and risk factors.

Results

Cause of death

Findings

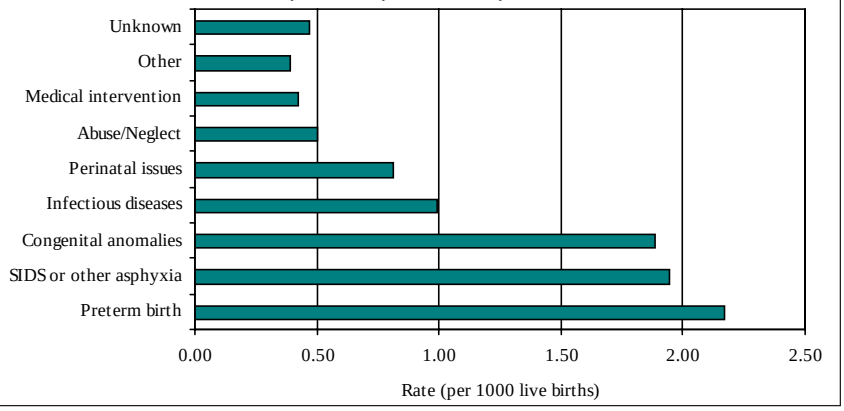
Of 501 known infant deaths that occurred during 1992-97, the committee reviewed 488 (97%). Allowing for multiple causes of death the committee found that the most common

causes of death were, in order, preterm birth, sudden infant death syndrome (SIDS) or other asphyxia of unknown etiology (collectively termed sudden unexplained death syndrome or SUDS), congenital anomalies, and infectious diseases (Figure 1). Alaska Natives had higher cause-specific infant mortality rates for all causes of infant death examined (Figure 2). The AMIMR committee judged that 34% of deaths were potentially preventable given the current state of medical knowledge, including 47% of Alaska Native deaths and 24% of non-Native deaths.

Conclusions of the AMIMR committee about underlying or contributory causes of infant deaths often differ from those identified on death certificates. The differences in conclusions are usually minor but occur in a range of 50-75% of cases reviewed. Using multiple causes of death, agreement was highest for congenital anomalies, SUDS, infections, and preterm birth. Agreement was lowest for the more subjective causes of medical interventions and abuse or neglect.

In assigning cause of death the AMIMR has different purposes and uses different standards and terminology from those of physicians and Medical Examiners who complete death certificates. Death certificates are legal documents and may be used in legal proceedings. "Cause of death" determinations on those documents must be supportable to standards of legal proof applicable in civil and criminal proceedings. AMIMR conclusions are made for purpose of identifying trends and prompting actions that improve the health and well being of women, infants and families. They are not used for legal or other action in individual cases. Thus AMIMR has more latitude to draw conclusions about *probable* underlying or contributing causes of death based on combined professional judgment of members. Because these conclusions are used for broad planning purposes they are not restricted to meeting limited legal standards of provability.

Figure 1. Cause-specific infant mortality rates for multiple causes of death; N=488; AMIMR, 1992-97



"Cause of death" has a special meaning in the legal context within the Medical Examiner's decisions are made – specifically referring to "the injury or disease that produces the physiologic derangement in the body that results in the individual dying." "Cause" of death in this context might be asphyxiation for a child who was smothered by a parent. "Manner" of death would be homicide. Child abuse would be an underlying cause in this instance because the actions that resulted in asphyxiation constitute abuse and were attributable to an adult with responsibility to care for the child. "Cause of death" was asphyxiation but the actions that resulted in the asphyxiation were abuse by a parent.

Committee recommendations

1. AMIMR Committee results should be used as the standard for Public Health decisions regarding policy/public health development.
2. A forensic pathologist from the State Medical Examiner's office should participate fully in AMIMR reviews.
3. The State Medical Examiner's office should be staffed sufficiently to allow a special focus in the area of pediatric forensics and full participation in AMIMR reviews. The AMIMR should advocate for resources needed by the State Medical Examiner's office to accomplish this.
4. Broaden membership of the AMIMR committee beyond physicians. Assure representation of Alaska Natives and other community members. Develop more diverse community representation on the committee.
5. All future AMIMR findings shall be carefully deliberated to insure cultural sensitivity before releasing them to the public.

Figure 2. Cause-specific infant mortality rates by Alaska Native status; AMIMR, 1992-97

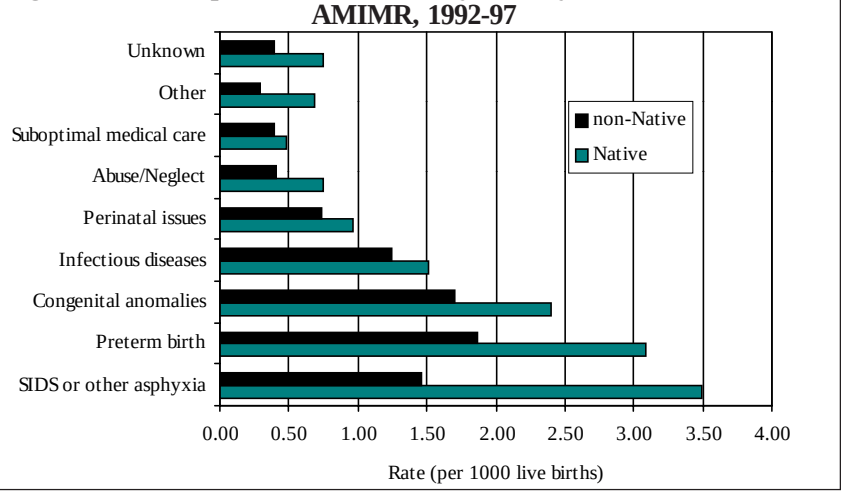


Table 1. Sudden unexplained death syndrome (SUDS)-specific infant mortality rates for 140 infants*; Alaska, 1992-97.

Risk group	SUDS deaths	SUDS mortality rate (per 1000 live births)	Rate ratio (95% confidence limits)
Infant birth weight			
<1500 g	5	8.1	4.0 (1.7, 9.8)
1500-2499 g	10	3.6	1.8 (0.96, 3.5)
>2499 g	121	2.0	Ref.
Maternal education			
<12	40	4.4	3.5 (2.2, 5.5)
12	56	2.2	1.7 (1.1, 2.6)
>12	35	1.3	Ref.
Maternal age			
<20	24	3.4	2.2 (1.3, 3.8)
20-29	82	2.4	1.6 (1.0, 2.3)
>29	33	1.5	Ref.
Maternal race			
Alaska Native	54	3.7	2.2 (1.5, 3.0)
Non-Native	84	1.7	Ref.
Anchorage resident			
Yes	61	2.3	1.0 (0.75, 1.5)
No	79	2.2	Ref.

*Not all risk factor information was known for all infants

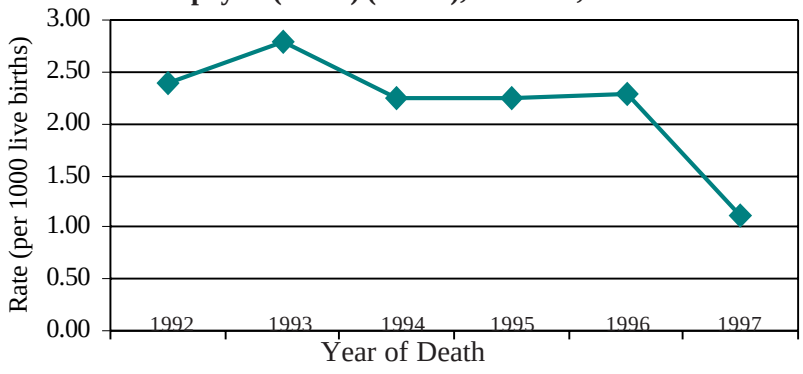
SIDS and asphyxia of unknown etiology (SUDS)

Findings

Although in general AMIMR-determined causes of death should be used, for the current analysis death certificate cause of death was used to identify SUDS cases for consistency with the many previous articles published on this subject. For 140 infants, the death certificate identified SUDS as the cause of death. SUDS was more common among low birth weight infants and the infants of Alaska Native and less educated women (Table 1). The Back to Sleep campaign encouraging caretakers to put infants to sleep on their backs was initiated in Alaska during 1996. Concurrent with this campaign, SUDS incidence declined from 2.4 per 1000 live births during 1992-96 to 1.3 per 1000 live births during 1997, a decline of 45% (Figure 3).

Among the 140 infants, 21% had a substantial physiological abnormality documented and 67% had documentation of parental tobacco, alcohol, or illicit substance use. Despite the common occurrence of physiological abnormalities and parental drug use, both known risk factors for SUDS, SUDS deaths rarely occurred in the absence of mechanical risk factors. Of 124 deaths for which this information was known, 122 (98%) involved infants that were sleeping prone (n=70), with another person (n=55), or outside of a standard infant crib (n=85). Said differently, only two SUDS deaths occurred to infants who slept alone, in a crib, and in the supine position; of these two deaths, one infant was found with a blanket wrapped around his face.

Figure 3. Infant mortality rates for SIDS or unexplained asphysia (SUDS) (N=140); AMIMR, 1992-97



Among 43 infants who slept with a parent on the night of death, 38 (88%) slept with a parent who had chart documentation of a history of drug use (most commonly tobacco cigarette use), 15 were found in the prone position, nine had a substantial physiological abnormality, and seven slept on a surface other than a non-water mattress or crib. In sum, one infant (2.3%) was identified whose only risk factor was sleeping with a non-impaired parent on a standard adult non-water mattress.

Committee recommendations

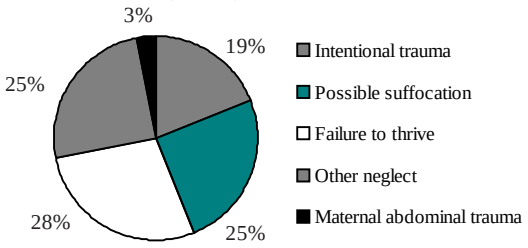
1. Increase parental education on supine sleeping position ("Back to Sleep"), safe bedding, and abstention from drug use particularly for parents who sleep with their infants.
2. Promote a statewide education program on risk factors for infant death for dissemination to expectant women in the hospital or clinical setting.
3. Support continued funding for Back to Sleep and Smoking Cessation Campaigns, including promotion of videos and media messages.
4. Promote substance abuse prevention.
5. Do in-depth analysis of co-sleeping by breast-feeding, crowding indicator (number of persons per room in the household), and income.

Abuse and neglect

Findings

For suspected abuse and neglect cases, cause of death determination for legal purposes is a decision made by the Medical Examiner. Associating abuse or neglect as the method by which a homicide was committed requires the ability to meet strict legal standards of provability. Few of the deaths reported here meet this criterion. Findings of the AMIMR committee that abuse or neglect resulted in or contributed to an infant's death represent the members' combined professional judgment about the most likely factors causing or contributing to the infant's death.

Figure 4. Infant deaths attributed to abuse or neglect, by mechanism (N=32); AMIMR, 1992-97



Those findings are not used for action in individual cases and are not restricted by the legal limitations of provability based on admissible evidence. Members of the AMIMR have more latitude in assigning causes that are likely but may not be provable to legal standards. Use of a standard different from the narrow legal standard used by the Medical Examiner is appropriate because no action in an individual case will result from determinations of the MIMR committee. These determinations are used solely to plan broad-based prevention efforts. The AMIMR committee identified 32 deaths associated with abuse or neglect. The implicated mechanisms included failure to thrive, intentional trauma, and suffocation (Figure 4). The cause specific infant mortality rate for abuse and neglect related deaths declined each year of the study period until 1997 when it climbed to the highest level of any year examined. The majority of abuse or neglect related deaths (78%) occurred in families with major social problems (Figure 5).

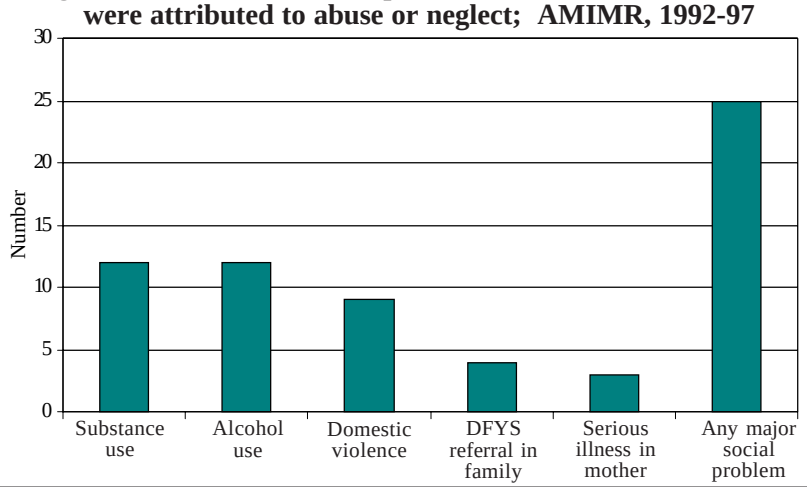
The overall rate of abuse or neglect related deaths was higher among Natives than non-Natives. Non-Natives, however, had a higher rate of deaths due to intentional suffocation or trauma while Natives had a higher rate of deaths due to failure to thrive or other neglect.

The Committee identified parental education, improved social supports, drug and alcohol cessation programs, and better social services intervention as actions that may have altered the outcome of these infant deaths.

Committee recommendations

1. Support continued funding for Healthy Families, an intensive home visitation program designed to decrease home-based violence and neglect. Share Healthy Families videos with other communities. Export Healthy Families materials and program successes to rural areas.
2. Foster better coordination with Healthy Families and other agencies for data analysis.
3. Recommend funding for the development of posters and videos on such topics as “Never Shake a Baby” and Healthy Families Programs for dissemination to physician and health care provider offices.

Figure 5. Characteristics of parents of 32 infants whose deaths were attributed to abuse or neglect; AMIMR, 1992-97



4. Suggest next year’s Health Summit theme center on issues concerning violence and infant mortality.
5. Increase coordination between the AMIMR Committee and the Alaska Child Fatality Review Team to assure maximum benefit to the two related but distinctly different efforts.

Parental drug use

Findings

Parental drug use was never the sole cause of death assigned by the AMIMR committee. Instead, it was cited as a contributing factor for some infant deaths. During 1992-97, the committee identified 36 deaths (7.4%) for which parental alcohol or illicit substance use contributed to death. In addition to these deaths, 48% of infant deaths occurred to mothers with a documented history of cigarette smoking, alcohol use, or illicit substance use. The issue of drug related infant deaths is examined in more detail in "The Contribution of Parental Alcohol and Illicit Substance Use to Alaska Native and non-Native Infant Mortality."

Committee recommendations

1. Promote substance abuse prevention in prenatal education programs as well as during the postnatal period.
2. Standardize prenatal assessment forms - encourage providers to use them to document such risk factors as alcohol/drug usage.

Medical intervention

Findings

For 27 infants, or approximately four per year, the committee determined that a medical intervention or lack of appropriate care may have contributed to death. Nineteen of these deaths were associated with surgery, anesthesia, or the quality of prenatal care. The remaining deaths were associated with a variety of providers and issues including poor care at an emergency room, primary care center, intensive care unit, or birthing center and lack of medication in a village.

Contributed by Brad Gessner, MD, MPH with input from Russ Webb

IN THIS ARTICLE:

- Parental alcohol or illicit substance use was a contributing or underlying cause of 7.4% of infant deaths in Alaska during 1992-97.
- Postnatal parental drug use was a more important cause of infant mortality than prenatal parental drug use.
- Women with less than 12 years of education and Alaska Native women were at particularly high risk of having a drug-related infant death.
- 48% of all infant deaths occurred to women whose records noted maternal use of alcohol, tobacco, or illicit drugs.

The Contribution of Parental Alcohol and Illicit Substance Use to Alaska Native and non-Native Infant Mortality

Introduction

Parental alcohol and illicit substance use may be associated with infant mortality through a variety of prenatal and postnatal mechanisms. We used the results of the Alaska Maternal and Infant Mortality Review (AMIMR) to determine the overall contribution of parental drug use to infant mortality in Alaska during 1992-97.

Methodology

AMIMR

The AMIMR process has been described in previous Family Health Datalines. Briefly, medical professionals from a variety of institutions meet once a month to review all infant deaths that occur in Alaska. For each reviewed death, a standard reporting form is completed documenting the suspected causes of death and potential interventions.

Study population and case definitions

All known deaths to Alaska resident, live born infants were included in the analysis. Deaths for which the committee identified alcohol or illicit substance use, but not tobacco use, as a definite or probable underlying or contributing cause of infant death were defined as *drug-related.*

Maternal drug-noted deaths included all infant deaths for which there was a notation of maternal illicit substance, alcohol, or tobacco use in one of the reviewed records regardless of whether or not drug use was considered to have contributed to death.

Results

During the study period 501 infants died for an overall IMR of 7.9 per 1000 live births. The AMIMR committee reviewed 488 of the 501 deaths (97%) and these formed the study population for the remainder of the analysis.

Overall, 36 (7.4%) of the 488 deaths evaluated met the case definition of drug-related for a cause-specific IMR of 0.57 per 1000 live births. Drug use was postulated to have contributed to infant death through a variety of mechanisms (Table 1). The committee identified postnatal drug use as contributory for 24 of the 36 deaths and prenatal drug use for 12 of the deaths. During univariate analysis, the drug-related cause-specific IMR was strongly associated with Alaska Native race and maternal education while no association was found with maternal age or Anchorage residence (Table 2).

Among the 488 deaths, 48% (235) met the case definition of maternal drug-noted for a cause-specific IMR of 3.7 per 1000 live births. During univariate analysis maternal drug-noted deaths were associated with maternal education and Alaska Native status and to a lesser extent with maternal age (Table 3).

Discussion

We found that maternal drug use was a commonly identified preventable cause of infant death and that many infant deaths occurred to women who use drugs. This was particularly true for less educated and Alaska Native women raising the possibility that some of the historical racial and educational differences in IMRs are related to parental drug use.

It is also possible, though, that provider tendencies to selectively screen less educated or Alaska Native women more intensively or the existence of an established prenatal drug screening program at Alaska Area Native Health Service-supported institutions led to an ascertainment bias. Because of this, reported IMRs within groups should be regarded as lower limits on IMR estimates.

Local and national programs tend to emphasize interventions that address prenatal drug use. Most of the drug-related deaths in our study, though, were associated with parental drug use after birth. While prenatal drug use may also have contributed to some of these deaths, others clearly were related primarily to postnatal parental impairment. This suggests that programs to limit maternal and paternal drug use should target both the prenatal and postnatal period.

The high proportion of infant deaths associated with maternal smoking found in our study, coupled with the known associations between prenatal and postnatal tobacco cigarette smoke and infant mortality, should prompt health care providers to counsel pregnant women and new parents about the dangers associated with cigarette smoking. Additionally, public health workers may want to adopt intervention strategies for cigarette smoking based on those successfully used to decrease maternal prenatal alcohol consumption.

Contributed by Brad Gessner, MD, MPH.

Tobacco, alcohol and drug use during pregnancy: Findings of the Alaska Pregnancy Risk Assessment Monitoring System, 1998.

- One in five women who deliver a live birth in Alaska smokes cigarettes during the last three months of pregnancy.
- One in 25 women who deliver a live birth in Alaska drinks alcohol during the last three months of pregnancy.
- One in 500 women who deliver a live birth in Alaska uses cocaine during pregnancy and one in 25 uses marijuana during pregnancy.

Table 1. Contribution of prenatal or postnatal maternal alcohol or illicit drug use to 36 drug-related infant deaths. Alaska Maternal-Infant Mortality Review; 1992-97

Pattern of use	Number (maternal cigarette smoking)
Parental alcohol or illicit substance use concurrent with asphyxial death. Mechanisms invoked included inappropriate choice of bedding the night of death, effect of intrauterine drug use on sudden infant death syndrome, failure to monitor infant, neglect, and possible intentional injury, but do not include possible overlying.	9 (7)
Alcohol-impaired parent sleeping with infant leading to possible overlying (one infant was found underneath an intoxicated parent)	8 (5)
Maternal prenatal alcohol or illicit substance use in the context of premature birth	7 (6)
Maternal prenatal alcohol use leading to fetal alcohol syndrome and other congenital anomalies	3 (2)
Probable or confirmed homicide by illicit substance or alcohol impaired mother	3 (3)
Maternal cocaine use associated with placental abruption	2 (2)
Maternal illicit substance use leading to failure to care for severely ill infant	2 (2)
Motor vehicle accident by alcohol impaired mother	1 (1)
Cardiac arrhythmia with a positive urine cocaine screen at birth	1 (1)

Table 2. For 488 infant deaths, the proportion and cause-specific infant mortality rates (IMRs) related to prenatal or postnatal parental alcohol or illicit drug use ("drug-related"). Alaska Maternal Infant Mortality Review, 1992-97.

Risk group	Infant deaths	Proportion drug-related	Drug-related IMR*	Risk ratio (95% CI†)
Maternal education				
<12 years	99	18%	2.0	27.4 (6.4, 118)
12 years	200	7%	0.54	2.1 (0.39, 12)
>12 years	149	1%	0.073	Ref.
Alaska Native				
Yes	165	16%	1.9	10 (4.7, 21)
No	315	3%	0.18	Ref.
Maternal age				
<20 years	77	4%	0.42	1.03 (0.28, 3.8)
20-29 years	242	10%	0.69	1.7 (0.78, 3.6)
>29 years	165	5%	0.41	Ref.
Residence				
Anchorage	239	7%	0.59	1.1 (0.56, 2.1)
non-Anchorage	249	8%	0.55	Ref.

* Infant mortality rates (IMRs) were calculated as drug-related deaths divided by total births in the category
† Confidence intervals

Table 3. For 488 infant deaths, the proportion and cause-specific infant mortality rates (IMRs) where maternal cigarette, alcohol, or illicit substance use was noted ("maternal drug-noted"). Alaska Maternal Infant Mortality Review, 1992-97.

Risk group	Infant deaths	Percent maternal drug-noted (alcohol or illicit substance use alone)	Maternal drug-noted IMR*	Risk ratio (95% CI†)
Maternal education				
<12 years	99	77% (51%)	8.4	6.1 (4.1 to 9.0)
12 years	200	53% (23%)	4.1	3.0 (2.0 to 4.3)
>12 years	149	26% (15%)	1.4	Ref.
Alaska Native				
Yes	165	73% (45%)	8.3	3.7 (2.8 to 4.8)
No	315	35% (14%)	2.3	Ref.
Maternal age				
<20 years	77	62% (30%)	6.8	2.1 (1.5 to 3.1)
20-29 years	242	49% (24%)	3.4	1.1 (0.80 to 1.4)
>29 years	165	42% (24%)	3.2	Ref.
Residence				
Anchorage	239	43% (22%)	3.8	1.0 (0.80 to 1.3)
non-Anchorage	249	53% (27%)	3.6	Ref.

* Infant mortality rates (IMRs) were calculated as drug-noted deaths divided by total births in the category
† Confidence intervals

Figure 6. Infant Mortality, Alaska, 1982-1997
Three-year moving averages