APPENDIX B: TECHNICAL NOTES

HOW TO USE VITAL STATISTICS

VITAL EVENTS

Vital events are registered with the Bureau of Vital Statistics and include live births, fetal deaths (after at least 20 weeks gestation), adoptions, marriages, divorces, and deaths. Information on each of these events is provided on standard forms (see Appendix F).

RELIABILITY OF THE DATA

The reliability of vital records may vary depending on the data collection method. For instance, some information on birth and death certificates is collected and provided by health facilities or medical professionals (birth weight, complications of labor and delivery, cause of death, etc.), while other information is self-reported or reported by relatives (smoking during pregnancy, marital status of deceased, etc.). The Bureau of Vital Statistics makes every effort to complete, verify, and correct information which is missing, invalid, or inconsistent. Ultimately, the reliability of the data depends on everyone who is involved in data collection, storage and retrieval: Bureau staff, medical professionals, magistrates, funeral directors, marriage commissioners, judges, and each individual involved in, or witness to, a vital event.

COMPARING DIFFERENT POPULATIONS

Comparing the number of events in two separate locations may not be meaningful. We can guess that Anchorage will have more births than Juneau because Anchorage has a larger population. A more meaningful question is, what is the number of births compared to the size of the population? To make this comparison, we calculate a rate or a ratio by dividing the number of events by the population for which that event could have occurred. For instance, if there were 4,200 births in Anchorage and a population of 280,000 people, then the ratio of births to population would be 4200/280000 or 0.015 births for every person living in Anchorage. If there were 500 births in Juneau and a population of 30,000 then the ratio of births to population in Juneau would be 500/30000 or 0.016666 births for every person living in Juneau.

Since small decimal numbers are awkward to interpret, we change the ratio to a rate by multiplying it by a constant of proportionality. This constant of proportionality can be any number, as long as the same number is used in calculating every rate. To calculate birth rates, we usually use a constant of proportionality of 1,000. Using this method, the birth rate for Anchorage would be 0.015*1,000 or 15.0 births per 1,000 population. The birth rate for Juneau would be 0.016666*1,000 or 16.7 births per 1,000 population. This number is usually rounded to the nearest tenth (16.7). We can see that while there are fewer births in Juneau in this example, the rate per 1,000 population is greater.

The birth rates described in the last paragraph are crude birth rates because they compare events to the total population. A more meaningful comparison would use only the female population of childbearing ages (15–44 years of age). Let's assume that the number of women ages 15–44 in Anchorage is 60,000 and in Juneau is 7,300. The Anchorage fertility rate would be (4200/60000)*1000 or 70.0 births for every 1,000 women of childbearing age. The Juneau fertility rate would be (500/7300)*1000 or 68.5 births for every 1,000 women of childbearing age. While Anchorage would have a lower crude birth rate than Juneau in this example, the Anchorage fertility rate would be higher than for Juneau. This is because the ratio of women of childbearing age to the total population in Anchorage (60000/280000 or .2143) is lower than in Juneau (7300/30000 or .2433).

Please note that all of the numbers in the foregoing examples are hypothetical for purposes of illustration.

CONSTANT OF PROPORTIONALITY

In calculating crude birth rates and fertility rates, we used a constant of proportionality of 1,000. Vital statistics may be reported with different constants of proportionality. Readers should familiarize themselves with how rates are calculated so that validity is maintained when comparing rates. Unless rates are calculated with the same constant of proportionality, comparisons will lead to incorrect conclusions. For instance, in this report we calculate death rates per 100,000 population. If the another publication reported deaths per 1,000 population, you would need to convert the rates in this report (by dividing by 100) or the death rates in the other report (by multiplying by 100) in order to make a valid comparison.

SMALL POPULATIONS & FEW EVENTS

Data based upon small populations and few events require particular care in data analysis. In Alaska, variability is expected when looking at small groups within the population. Precautions are taken to avoid drawing false conclusions from random or unusual events. A method that is used in this report to provide greater reliability is moving averages. (For an explanation of moving averages, see "Vital Statistics Formulas" below.)

VITAL STATISTICS FORMULAS

AGE-ADJUSTED RATES

Age-adjusted rates are calculated so comparisons can be made between populations that have different age distributions. For example, a population with a high proportion of young people, generally will have a lower crude death rate than a population with a high percentage of elderly persons. Age-adjusted rates are more appropriate than crude rates when comparing health indicators for populations that have different age distributions. The age-adjusted rates in this report were calculated using the standard population based on the decennial U.S. Census of 2000 (see the Standard Population in Appendix A).

Age-Adjusted Death Rate = $\sum m_a \ (P_a/p)$

where:

$\sum$ is sum

m_a is the age-specific death rate

P_a is the standard population for the age group

p is the total standard population

MOVING AVERAGES

Calculations of 3-year, 5-year, and 10-year moving averages are performed when single-year rates are not reliable. When calculations are based on small numbers, moving averages can help to smooth out rates which vary widely from one year to another.

In Alaska, single-year infant mortality rates are seldom good indicators for the state of health within populations because rates can fluctuate dramatically from year to year. In Alaska, 132 infants died during 1988 and 108 infants died during 1989. The single-year infant mortality rates during 1988 and 1989 were 11.7 and 9.3, respectively. The 3-year moving average IMR (using 1986, 1987, and 1988 data) was 11.0 and (using 1987, 1988, and 1989) 10.4 infant deaths per 1,000 live births.

YEARS OF POTENTIAL LIFE LOST

Years of potential life lost (YPLL) is the difference between the standardized age of 65 and the age of a decedent who dies before age 65. For purposes of calculation, deaths are assumed to occur at the midpoint of a five-year age interval; i.e. a 41-year-old decedent is assumed to be 42.5 years or halfway between 40 and 45. A person dying at age 41 would be said to have 22.5 years of life lost (65–42.5). Years of potential life lost emphasizes mortality in younger populations and is used in this report to measure the impact of specific causes of death. For a specific decedent group, Years of Life Lost is calculated as follows:

$YLL = \sum 65\text{-}mp$

Where:

YLL is years of life lost

$\sum$ is sum of all decedents' years of potential life lost

65 represents years of potential life

mp is the mid-point of the decedent's 5-year age group

STANDARD ERROR

The standard error of a statistic is the standard deviation of the sampling distribution of that statistic. Standard errors are important because they reflect how much sampling fluctuation a statistic will show. The inferential statistics involved in the construction of confidence intervals and significance testing are based on standard errors. The standard error of a statistic depends on the sample size. In general, the larger the sample size, the smaller the standard error. The standard error of a statistic is usually designated by the Greek letter sigma (σ) with a subscript indicating the statistic. For instance, the standard error of the mean is indicated by the symbol: σ_M.

EXPECTATION OF LIFE

Expectation of life is the number of years infants born in a specific year can expect to live if they experience the same age-specific death rates for all persons who died during their birth year. Table B.1 illustrates the calculation of life expectancy for all Alaskans based on data from the five year period 2001–2005.

TABLE B.1 EXPECTATION OF LIFE FOR ALL ALASKANS: 2001–2005

	COLUMN IDENTIFICATION AND DESCRIPTION									
	A	B	C	D	E	F	G	H	I	J
AGE AT DEATH	DEATHS	POPULATION	RATIO	PROPORTION DYING IN AGE GROUP	PROPORTION LIVING IN AGE GROUP	# LIVING AT BEGINNING OF AGE GROUP	# DYING IN AGE GROUP	# LIVING IN AGE GROUP	CUMULATIVE POPULATION	YEARS LEFT AT BEGINNING OF AGE GROUP
<1	338	51283	0.0065908781	0.0065692296	0.9934307704	100,000	657	99,442	7,559,016	75.6
1-4	83	206108	0.0004027015	0.0016091859	0.9983908141	99,343	160	396,973	7,459,575	75.1
5–9	41	257354	0.0001593136	0.0007962510	0.9992037490	99,183	79	495,719	7,062,602	71.2
10–14	116	283918	0.0004085687	0.0020407589	0.9979592411	99,104	202	495,016	6,566,884	66.3
15–19	269	267162	0.0010068797	0.0050217578	0.9949782422	98,902	497	493,268	6,071,868	61.4
20–24	321	207098	0.0015499908	0.0077200392	0.9922799608	98,405	760	490,127	5,578,600	56.7
25–29	281	209862	0.0013389751	0.0066725398	0.9933274602	97,646	652	486,599	5,088,472	52.1
30–34	303	231238	0.0013103383	0.0065302991	0.9934697009	96,994	633	483,387	4,601,873	47.4
35–39	495	250979	0.0019722766	0.0098129980	0.9901870020	96,361	946	479,439	4,118,486	42.7
40–44	720	282830	0.0025456988	0.0126479992	0.9873520008	95,415	1,207	474,059	3,639,046	38.1
45–49	981	278345	0.0035244032	0.0174681042	0.9825318958	94,208	1,646	466,927	3,164,988	33.6
50–54	1072	237409	0.0045154143	0.0223250545	0.9776749455	92,563	2,066	457,647	2,698,061	29.1
55–59	1113	169569	0.0065636997	0.0322886659	0.9677113341	90,496	2,922	445,176	2,240,413	24.8
60–64	1213	108789	0.0111500244	0.0542382279	0.9457617721	87,574	4,750	425,996	1,795,237	20.5
65–69	1160	70550	0.0164422395	0.0789652825	0.9210347175	82,824	6,540	397,771	1,369,241	16.5
70–74	1482	52583	0.0281840138	0.1316444002	0.8683555998	76,284	10,042	356,314	971,470	12.7
75–79	1697	37798	0.0448965554	0.2018291885	0.7981708115	66,242	13,370	297,785	615,156	9.3
80–84	1625	23068	0.0704439050	0.2994784468	0.7005215532	52,872	15,834	224,776	317,371	6.0
85+	2095	16931	0.1237375229	0.4725173106	0.5274826894	37,038	37,038	92,595	92,595	2.5

Column A: **Total deaths during five years**

Column B: **Sum of population for each of the five years**

Column C: **Ratio** (A/B)

Column D: **Proportion dying in the age group**
For less than 1 year: (2*C)/(2+C);
for 1–4: years:(2*4*C)/(2+4*(1.25*C));
all others (2*5*C)/(2+5*C)

Column E: **Proportion living in age group** (1-D)

Column F: **Number living at beginning of age**
For less than 1 year: 100,000; all others:
E*F (both from next younger age group)

Column G: **Number dying in the age group**
F (this age group)-F (next older age group)

Column H: **Number living in the age group**
For less than one year: F-(.85*G); for 1–4 years: 4*F-(2.5*G); all others: (5*F)-(2.5*G)

Column I: **Cumulative population** Sum of H for this and all older age groups

Column J: **Years left at beginning of age** (I/F)