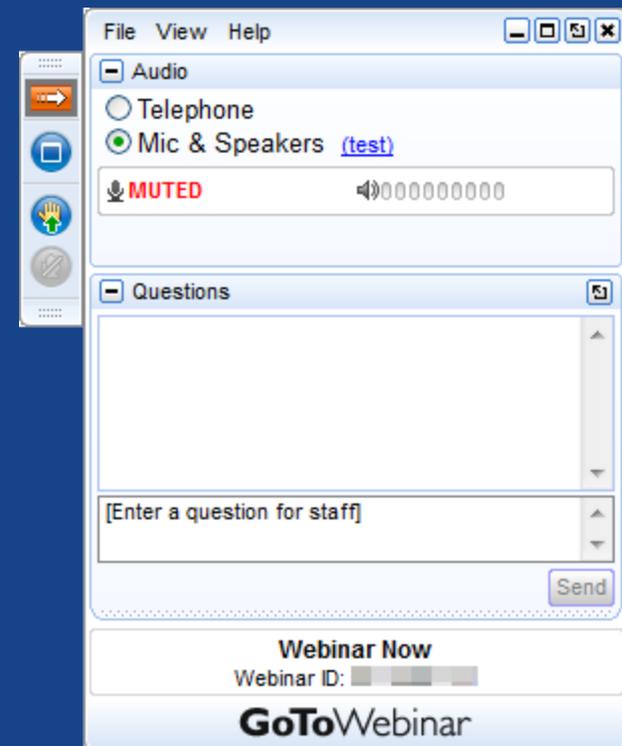


Chronic Disease Prevention & Health Promotion Webinar Series

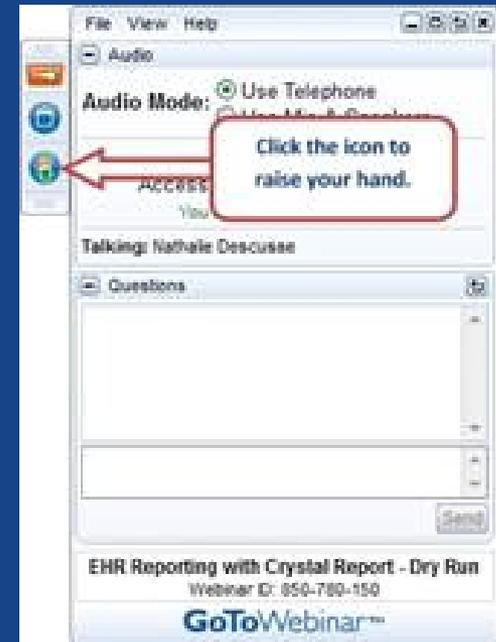
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Yakutat Cancer Study



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Study Background

- Ankau Saltchucks used by Yakutat residents for subsistence harvesting and a Culture Camp
- Also location of US military installations and dump sites from WWII, used by federal government agencies through 1970s
- Health concerns due to pollution from military installations led to change in harvest locations and closure of Culture Camp

Cancer Study: 3 Reports

- Observed vs. Expected number of cancer cases
- Observed vs. Expected number of cancer deaths
 - Are the number of observed cancers greater than the number of expected cancers (cases & deaths)?
- Number & types of cancer cases and cancer deaths
 - Are the number and types of cancers reported in the community unusual (cases & deaths)?

Some Basic Information about Cancer

- ❑ Cancer is not one disease
- ❑ Cancer is more common than most people realize
- ❑ About 50% of men and 33% of women will develop cancer
- ❑ About 24% of all deaths nation-wide are from cancer

Some Basic Information about Cancer Statistics

- ❑ Cancer rate = # cancer cases / population
- ❑ Small fraction, so multiply by 100,000
- ❑ Example: Incidence rate for Alaska for 2007-2011 is 459 per 100,000 persons.
- ❑ Will be some variability, expressed as a confidence interval

First Report: Observed vs. Expected Cancer Cases

- ❑ Determine the number of reported cancer cases for the community of Yakutat
- ❑ Calculate the number of expected cancers
- ❑ Is observed greater than expected?
- ❑ If so, is the difference statistically significant?

Observed Number of Cases

- ❑ Alaska Cancer Registry is data source
- ❑ Contains information about all cancer patients in AK since 1996 reported by their healthcare providers
- ❑ Hospitals, physicians, pathology labs, & other state's cancer registries
- ❑ Observed cases in Yakutat 1996-2011 is 44

Expected Number of Cases

- Involves a calculation
- Need to know:
 - ▣ Cancer rate for the entire state of Alaska
 - ▣ Population of Yakutat

Calculating Expected Number of Cases

- If population demographics were identical throughout Alaska, then this would be easy!

$$\begin{array}{rcl} \text{AK Incid} & & \text{Expected No} \\ \text{Rate} & & \text{of Cases} \\ \text{-----} & = & \text{-----} \\ 100,000 & & \text{Community} \\ & & \text{Population} \end{array}$$

- Need to account for the difference in age distribution between the state and the community
- Do calculation for each age group
- Add each age group up to get expected cases per year

For 1996-2005, Yakutat

Age Category	Alaska Incid Rate, 1996-2005	Yakutat Population, 2000 US Census	Expected No. of Cases
00-04 years	24.5	38	0.009
05-09 years	9.6	70	0.007
10-14 years	8.6	62	0.005
15-19 years	18.8	58	0.011
20-24 years	34.3	25	0.009
25-29 years	63.3	32	0.020
30-34 years	79.9	53	0.042
35-39 years	124.8	65	0.081
40-44 years	198.8	63	0.125
45-49 years	340.1	76	0.258
50-54 years	538.3	51	0.275
55-59 years	848.8	26	0.221
60-64 years	1373.0	22	0.302
65-69 years	1977.4	14	0.277
70-74 years	2437.0	14	0.341
75-79 years	2764.7	10	0.276
80-84 years	2799.9	0	0.000
85+ years	2408.7	1	0.024
TOTAL		680	2.284
Expected over 10 years			22.8

- Need to account for changes in population over time
- Use both 2000 and 2010 population data from US Census

For 2006-2011, Yakutat

Age Category	Alaska Incid Rate, 2006-2011	Yakutat Population, 2010 US Census	Expected No. of Cases
00-04 years	24.9	40	0.010
05-09 years	13.1	42	0.006
10-14 years	12.0	41	0.005
15-19 years	21.2	53	0.011
20-24 years	34.6	34	0.012
25-29 years	51.6	42	0.022
30-34 years	91.1	36	0.033
35-39 years	118.8	46	0.055
40-44 years	210.4	48	0.101
45-49 years	351.3	56	0.197
50-54 years	540.9	54	0.292
55-59 years	799.9	60	0.480
60-64 years	1155.0	46	0.531
65-69 years	1688.3	23	0.388
70-74 years	2208.8	20	0.442
75-79 years	2444.0	9	0.220
80-84 years	2482.6	7	0.174
85+ years	2416.0	5	0.121
TOTAL		662	3.098
Expected over 6 years			18.6
Total expected over 16 years			41.4

Calculating Expected Number of Cases

- Assumes proportion of race groups in Yakutat is the same as Alaska statewide
- Each race group has different top ranked cancers
- Expand each of the two tables for Alaska Native, White, Black, Asian/Pacific Islander



For 1996-2005, Yakutat

Age Category	White			Black			AK Native			Asian/PI		
	Alaska Incid Rate, 1996-2005	Yakutat Pop, 2000 US Census	Expected No. of Cases	Alaska Incid Rate, 1996-2005	Yakutat Pop, 2000 US Census	Expected No. of Cases	Alaska Incid Rate, 1996-2005	Yakutat Pop, 2000 US Census	Expected No. of Cases	Alaska Incid Rate, 1996-2005	Yakutat Pop, 2000 US Census	Expected No. of Cases
00-04 yrs	23.8	10	0.002	12.5	0	0.000	28.7	26	0.007	30.2	2	0.001
05-09 yrs	9.8	22	0.002	0	0	0.000	10.3	48	0.005	14.7	0	0.000
10-14 yrs	10.2	18	0.002	0	0	0.000	5.5	44	0.002	10.1	0	0.000
15-19 yrs	19.7	12	0.002	0	0	0.000	19.3	45	0.009	18.1	1	0.000
20-24 yrs	37.5	7	0.003	15.6	0	0.000	32.2	17	0.005	11.9	2	0.000
25-29 yrs	65.6	17	0.011	45.1	0	0.000	64.7	14	0.009	34.3	1	0.000
30-34 yrs	83.4	29	0.024	76.6	1	0.001	71.9	21	0.015	45.7	2	0.001
35-39 yrs	119	39	0.047	123.6	0	0.000	146.8	25	0.036	114.9	1	0.001
40-44 yrs	194.4	31	0.060	197	0	0.000	242.6	32	0.078	135	0	0.000
45-49 yrs	337.3	45	0.150	381.2	0	0.000	372.2	30	0.113	262.8	1	0.003
50-54 yrs	531.3	31	0.163	680.1	0	0.000	635.8	17	0.106	327.3	4	0.012
55-59 yrs	830.4	16	0.135	974	0	0.000	1024.5	9	0.088	499.5	1	0.006
60-64 yrs	1375.4	9	0.124	1665.2	0	0.000	1518.9	11	0.167	722.2	2	0.014
65-69 yrs	2031.5	8	0.152	2311.2	0	0.000	1812.6	6	0.100	1424.9	1	0.014
70-74 yrs	2519.3	7	0.176	2383.1	0	0.000	2375.1	7	0.166	1402.4	0	0.000
75-79 yrs	2775.6	6	0.167	3579.1	0	0.000	2834.7	4	0.113	1859.3	0	0.000
80-84 yrs	2755.5	0	0.000	2567.1	0	0.000	3294.7	0	0.000	1934.9	0	0.000
85+ yrs	2442.1	0	0.000	1067.6	0	0.000	2397.9	1	0.024	2400	0	0.000
TOTAL		306	1.221		1	0.001		355	1.044		18	0.052
OVER 10 YEARS			12.214			0.009			10.444			0.523

For 2006-2011, Yakutat

Age Category	White			Black			AK Native			Asian/PI		
	Alaska Incid Rate, 2006-2011	Yakutat Pop, 2010 US Census	Expected No. of Cases	Alaska Incid Rate, 2006-2011	Yakutat Pop, 2010 US Census	Expected No. of Cases	Alaska Incid Rate, 2006-2011	Yakutat Pop, 2010 US Census	Expected No. of Cases	Alaska Incid Rate, 2006-2011	Yakutat Pop, 2010 US Census	Expected No. of Cases
00-04 yrs	23.2	23	0.005	9.9	0	0.000	32.7	17	0.006	44.7	0	0.000
05-09 yrs	11.1	18	0.002	10.4	0	0.000	21.3	21	0.004	26.2	3	0.001
10-14 yrs	11.6	16	0.002	5.8	0	0.000	14.4	19	0.003	21.2	6	0.001
15-19 yrs	19.2	18	0.004	18	0	0.000	31.7	33	0.011	25.2	1	0.000
20-24 yrs	41.1	14	0.006	5.5	0	0.000	33.3	20	0.007	21.2	0	0.000
25-29 yrs	46.6	22	0.010	57.9	0	0.000	88.5	16	0.014	40.6	4	0.001
30-34 yrs	86.4	20	0.017	68.2	0	0.000	134.4	12	0.017	86.3	3	0.003
35-39 yrs	113.8	32	0.036	94.8	0	0.000	178.6	12	0.021	151.6	2	0.004
40-44 yrs	211	26	0.055	221.4	0	0.000	256.2	16	0.041	192.3	6	0.012
45-49 yrs	344	33	0.113	260.9	1	0.003	486.3	18	0.085	333.7	4	0.015
50-54 yrs	532	27	0.141	712.2	1	0.007	739.9	22	0.166	480.3	4	0.019
55-59 yrs	805.6	33	0.267	929.5	0	0.000	971.9	25	0.240	619.5	2	0.013
60-64 yrs	1153	22	0.252	1588.7	0	0.000	1558.3	22	0.342	824.7	2	0.018
65-69 yrs	1693.9	8	0.141	2058.7	0	0.000	2001.8	10	0.200	1410.5	5	0.066
70-74 yrs	2250.6	7	0.165	2227.7	0	0.000	2755.8	11	0.312	1418.2	1	0.019
75-79 yrs	2461.2	3	0.074	1929.5	0	0.000	2883.3	4	0.115	2115.8	1	0.021
80-84 yrs	2500.3	2	0.050	2547.8	0	0.000	3158.3	5	0.158	1918.5	0	0.000
85+ yrs	2464.4	4	0.099	3505.5	0	0.000	2436.8	1	0.024	2193.6	0	0.000
TOTAL		329	1.439		2	0.010		285	1.767		45	0.194
OVER 6 YEARS			8.635			0.060			10.599			1.162

Observed vs. Expected

Cancer Type	Location	Number of Observed Cancer Cases 1996-2011	Number of Expected Cancer Cases 1996-2011	Difference (Observed minus Expected)
All Cancer Sites Combined	Yakutat	44	44	0

Calculating Standard Incidence Ratio

- If number of observed cases is greater than number of expected cases, then calculate Standard Incidence Ratio (SIR)
- $(\# \text{ Observed} / \# \text{ Expected}) \times 100$
- Calculate SIR upper and lower confidence intervals
- If confidence interval does not include 100, then the # observed is statistically significantly different from # expected



Observed vs. Expected

Cancer Type	Location	Number of Observed Cancer Cases 1996-2011	Number of Expected Cancer Cases 1996-2011	Difference (Observed minus Expected)
All Cancer Sites Combined	Yakutat	44	44	0

Location	Standard Incidence Ratio (SIR)	Lower Confidence Interval	Upper Confidence Interval
Yakutat	100.9	71.1	130.7

Second Report: Observed vs. Expected Cancer Deaths

- ❑ Determine the number of reported cancer deaths for the community of Yakutat
- ❑ Calculate the number of expected cancer deaths
- ❑ Is observed greater than expected?
- ❑ If so, is the difference statistically significant?

Observed Number of Deaths

- Alaska Bureau of Vital Statistics is data source
- Contains information about all cancer deaths in AK as determined by the healthcare provider filling out the death certificate
- Observed cancer deaths in Yakutat 1996-2012 is 19

Expected Number of Cancer Deaths

- Involves a calculation
- Need to know:
 - ▣ Cancer death rate for the entire state of Alaska
 - ▣ Population of Yakutat

Observed vs. Expected

Cancer Type	Location	Number of Observed Cancer Deaths 1996-2012	Number of Expected Cancer Deaths 1996-2012	Difference (Observed minus Expected)
All Cancer Sites Combined	Yakutat	19	16	3

Location	Standard Mortality Ratio (SMR)	Lower Confidence Interval	Upper Confidence Interval
Yakutat	115.5	63.6	167.4

Third Report: Number and Types of Cancers

- ❑ Alaska Cancer Registry for reported cancer cases
- ❑ Bureau of Vital Statistics' State Mortality Database for reported cancer deaths
- ❑ Number of cancers per year
- ❑ Compare Yakutat cancers to top-ranked statewide cancers

Cancer Cases Per Year

- 44 cases between 1996-2011
- About 3 new cases per year
- Change from year to year appears to be random

DxYear	Count
1996	5
1997	6
1998	5
1999	2
2000	3
2001	3
2002	1
2003	1
2004	2
2005	2
2006	5
2007	1
2008	2
2009	3
2010	2
2011	1
TOTAL	44

Cancer Types

- Top 4 most common are lung, colorectal, prostate, female breast
- Top 4 are 52% of total cases
- They are also the 4 most common cancers state-wide

Cancer Type	Count
Lung	8
Colorectal	6
Prostate	5
Breast	4
Hypopharynx	2
Leukemia	2
Non-Hodgkin Lymphoma	2
Stomach	2
Testis	2
Uterus	2
Anus	1
Bladder	1
Brain	1
Esophagus	1
Hodgkin Lymphoma	1
Kidney	1
Melanoma	1
Nasopharynx	1
Thyroid	1

Cancer Deaths Per Year

- 19 deaths between 1996-2012
- About 1 new case per year
- Change from year to year appears to be random

Death Year	Count
1996	0
1997	4
1998	3
1999	0
2000	2
2001	0
2002	2
2003	1
2004	1
2005	1
2006	0
2007	3
2008	0
2009	0
2010	0
2011	1
2012	1
TOTAL	19

Cancer Death Types

- Top 3 most common are lung, prostate, leukemia
- Top 3 are 58% of total cases
- Lung is the most common cancer death state-wide

Cancer Type	Count
Lung	7
Prostate	2
Leukemia	2
Brain	1
Breast	1
Colorectal	1
Esophagus	1
Extrahepatic Bile Ducts	1
Pancreas	1
Testis	1
Stomach	1
TOTAL	19

Third Report Conclusion

- There does not appear to be an unusually high number of cases in a large cluster of years and the distribution by year appears to be random
- There does not appear to be a high number of uncommon cancers

Community Dialog

- ❑ ACR staff presented study at community meeting in Yakutat via teleconference
- ❑ Joe Sarcone of ATSDR in Yakutat as moderator
- ❑ Q&A period after the presentation
- ❑ Positive reception by community

Positive Outcomes

- Tribal leaders of Yakutat Tlingit Tribe shifted from searching for cancer causes to screening and early detection
- SEARHC was contacted to check on availability of screening technology for Yakutat. Mammography unit shipped from Fairbanks via road and ferry.
- Provided 41 women with mammograms in May 2015

Positive Outcomes

- ACR invited by Yakutat Tlingit Tribe leaders to present the study with them at 2 conferences in Anchorage
 - ▣ Alaska Tribal Conference on Environmental Management
 - ▣ Alaska Forum on the Environment

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Discussion