

# Epidemiology of Viral Hepatitis in Alaska

Brian J McMahon

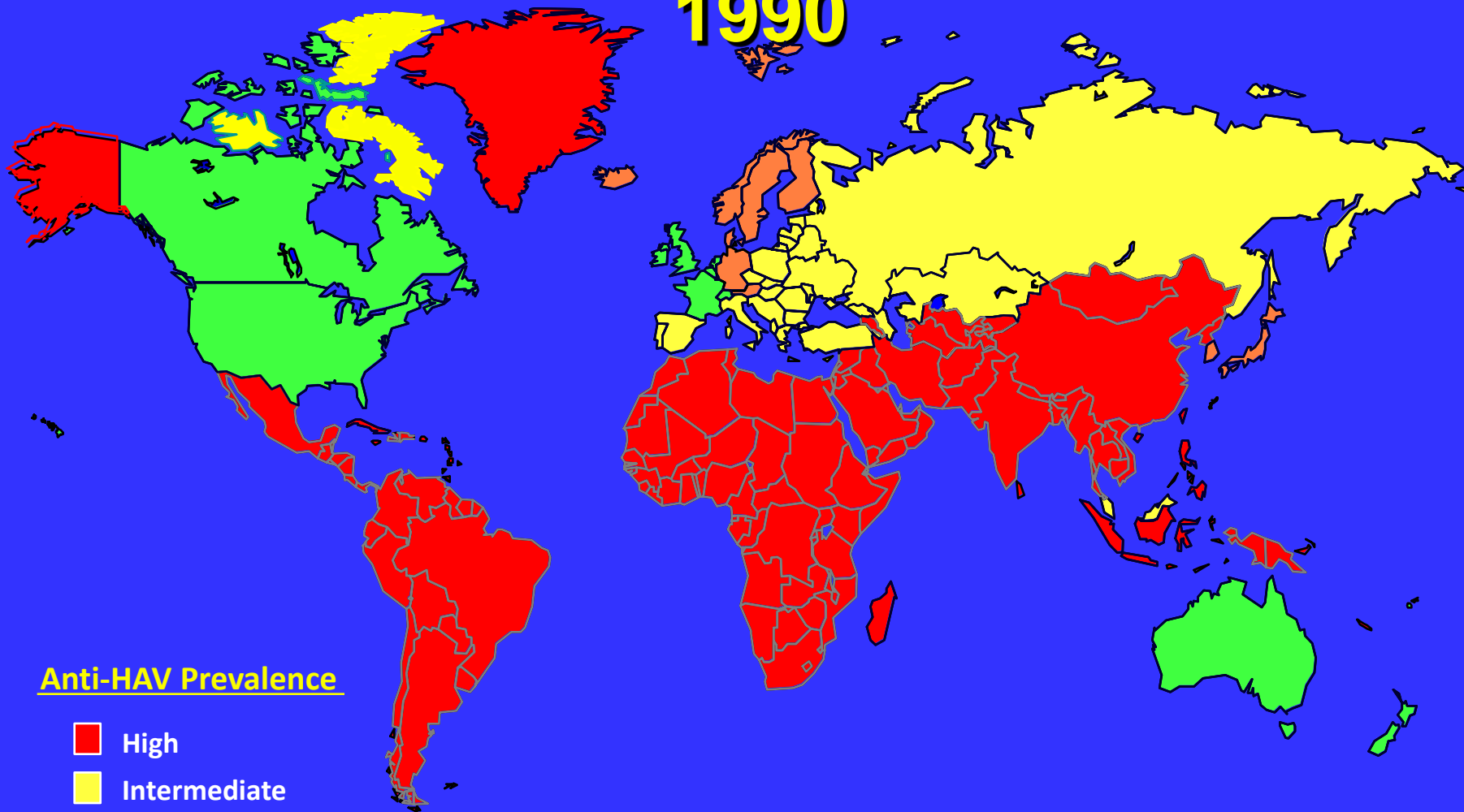
Alaska Native Tribal Health  
Consortium and Arctic Investigation  
Program/CDC

# Hepatitis A: Background

- Prior to the availability of hepatitis A vaccine Alaska experienced large recurrent outbreaks of acute hepatitis A with the highest impact in rural areas.
- Introduction of universal childhood vaccination has dramatically reduced the incidence of acute HAV in Alaska from the highest in the US to the lowest in the world

# Geographic Distribution of HAV Infection

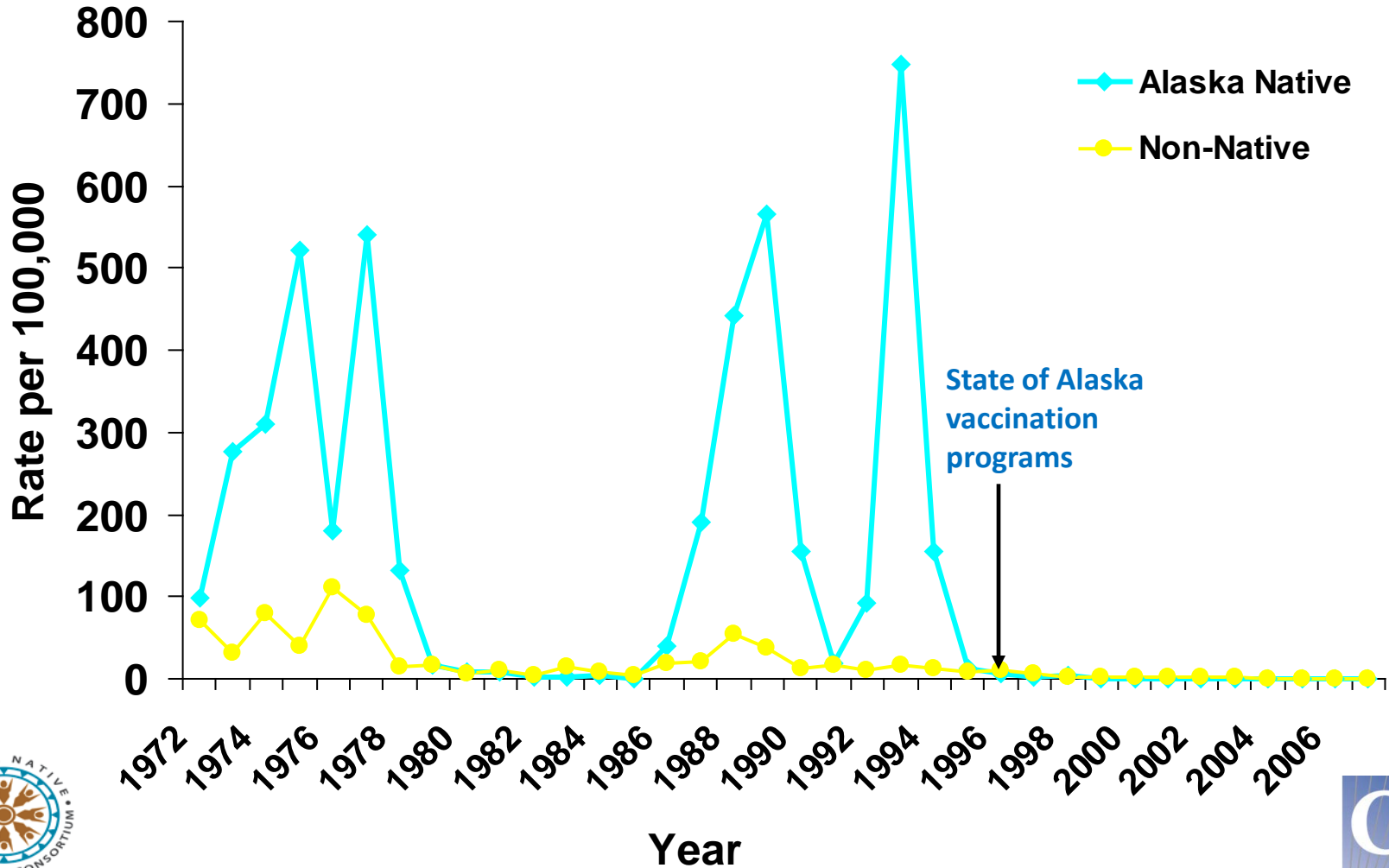
## 1990



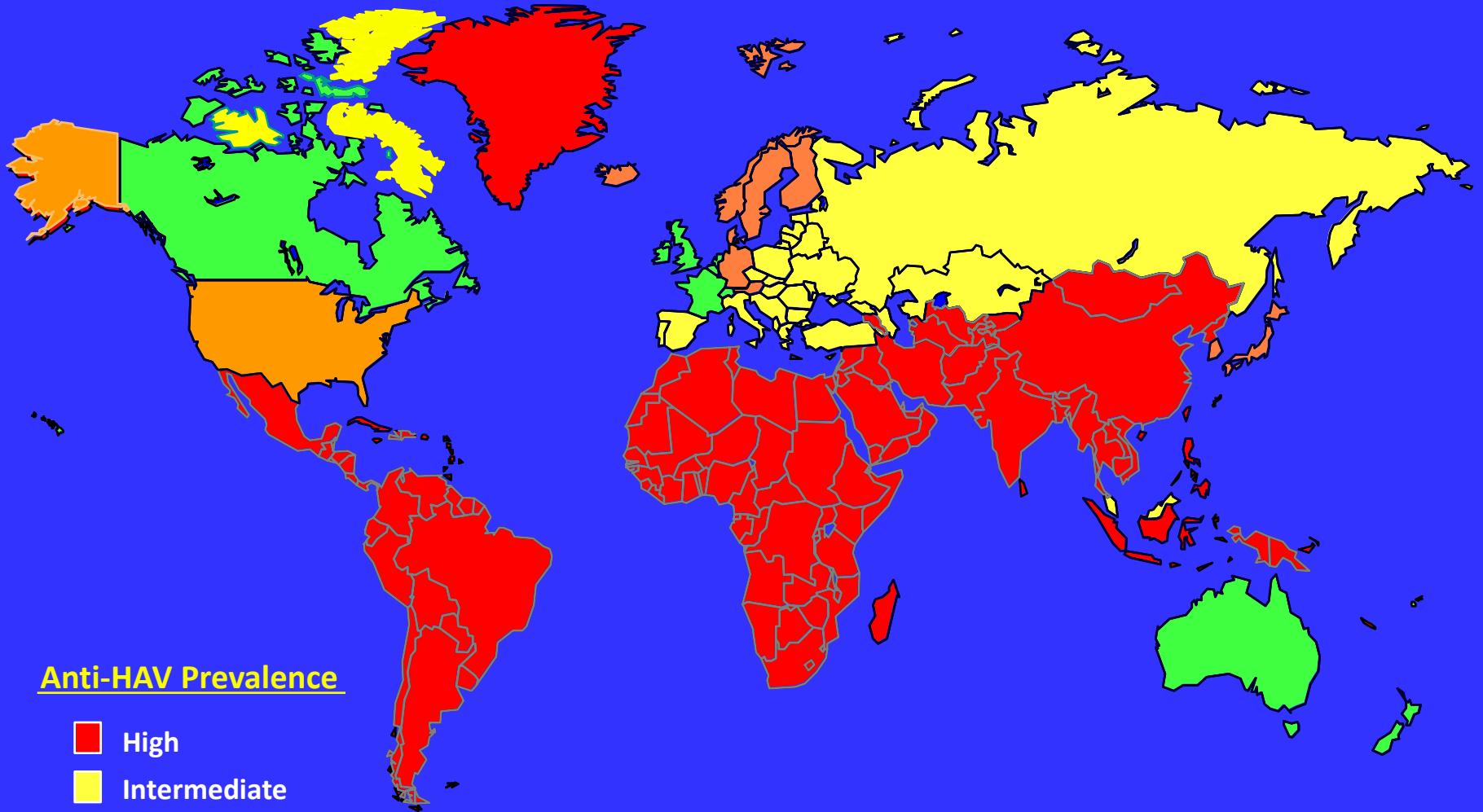
### Anti-HAV Prevalence

- High
- Intermediate
- Low
- Very Low

# Hepatitis A in Alaska Natives and Non-Natives in Alaska, by Year



# Geographic Distribution of HAV Infection 2010



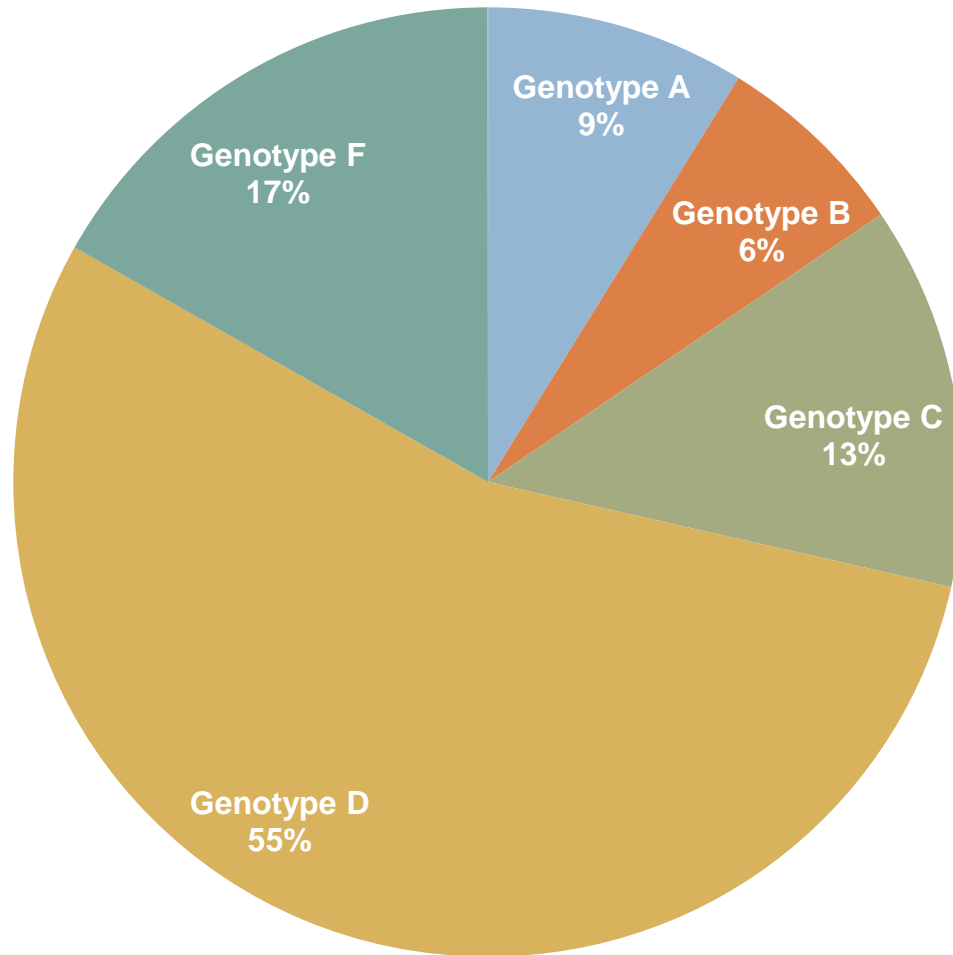
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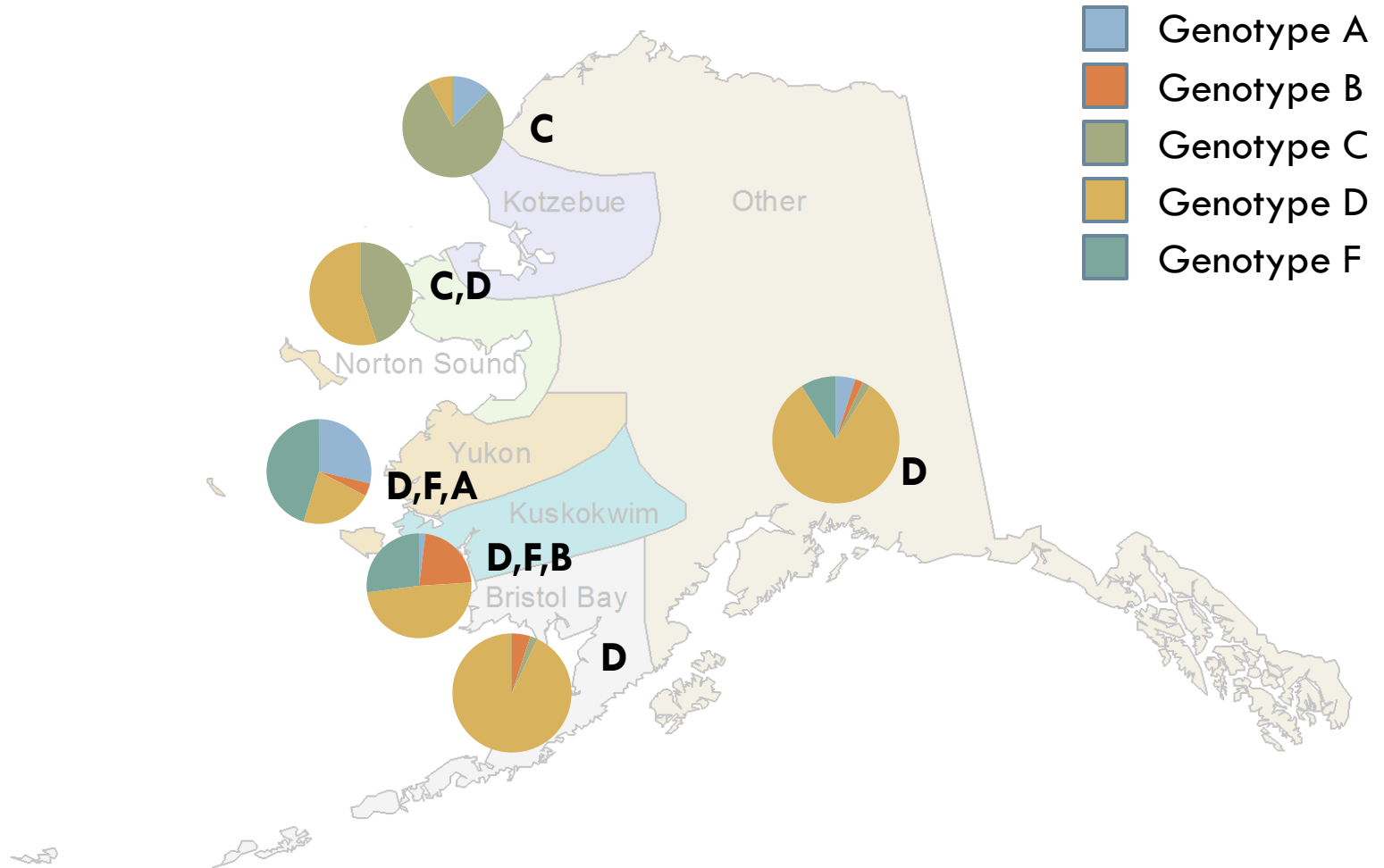
# Alaska Population-Based HBV Cohort

- 1560 patients identified between 1974 and 1987 with chronic HBV infection
- 1350 patients are still alive
- Acute HBV in Alaska previously reviewed by Lisa Bulkow

# Alaska HBV Genotype Distribution Survey

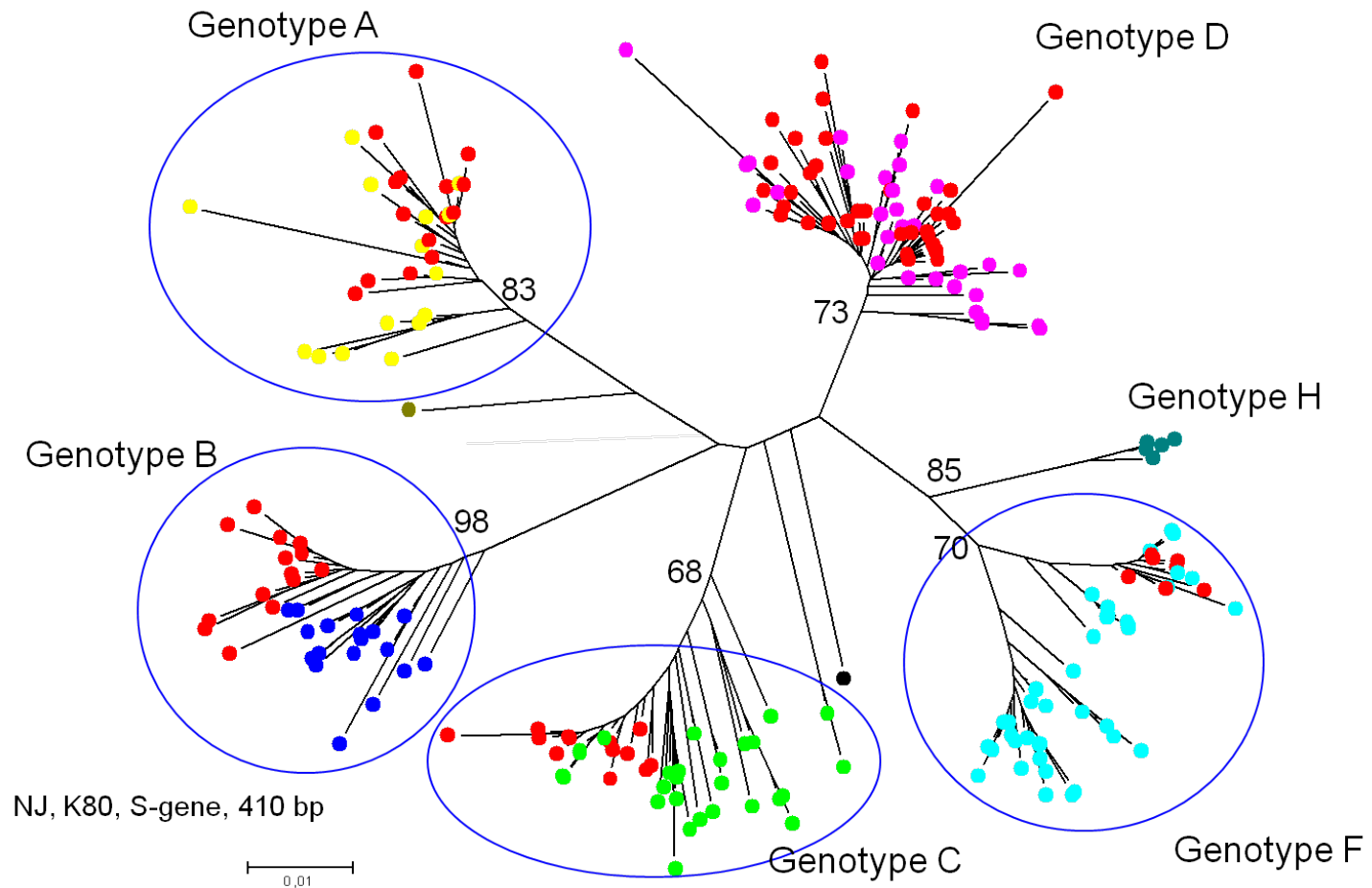


# Alaska HBV Genotype Distribution Survey

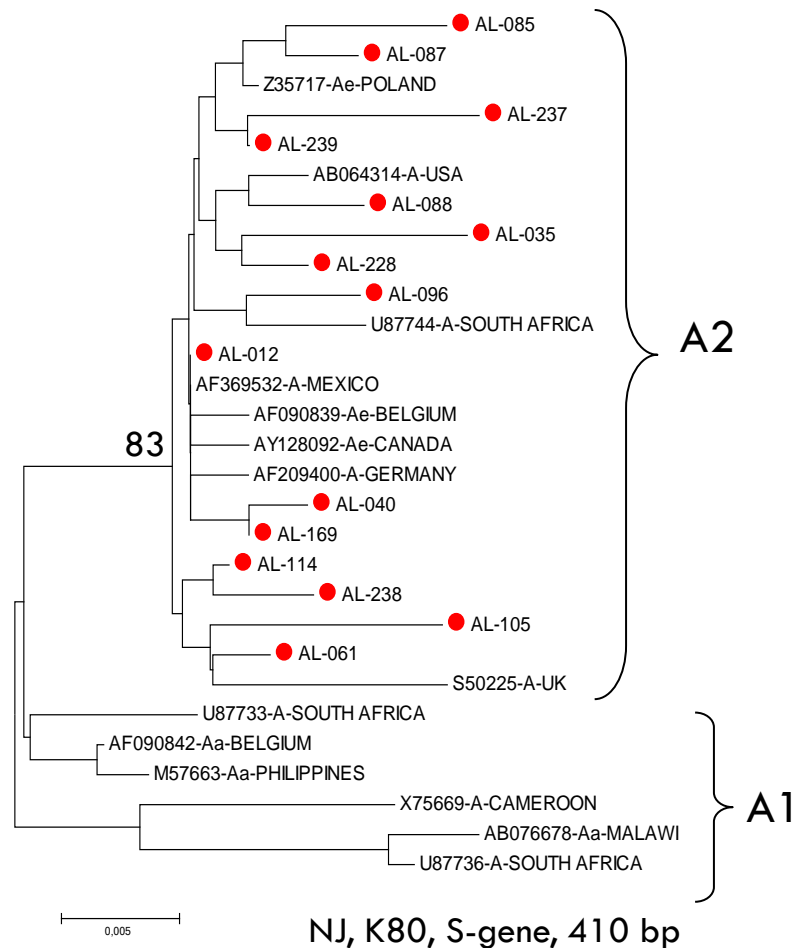




# Alaska HBV Genotype Distribution Survey

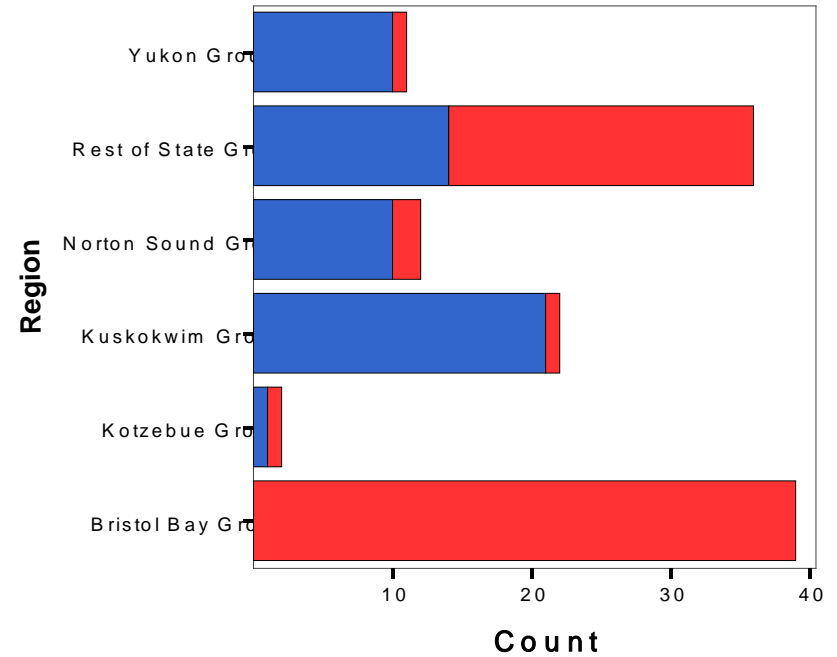
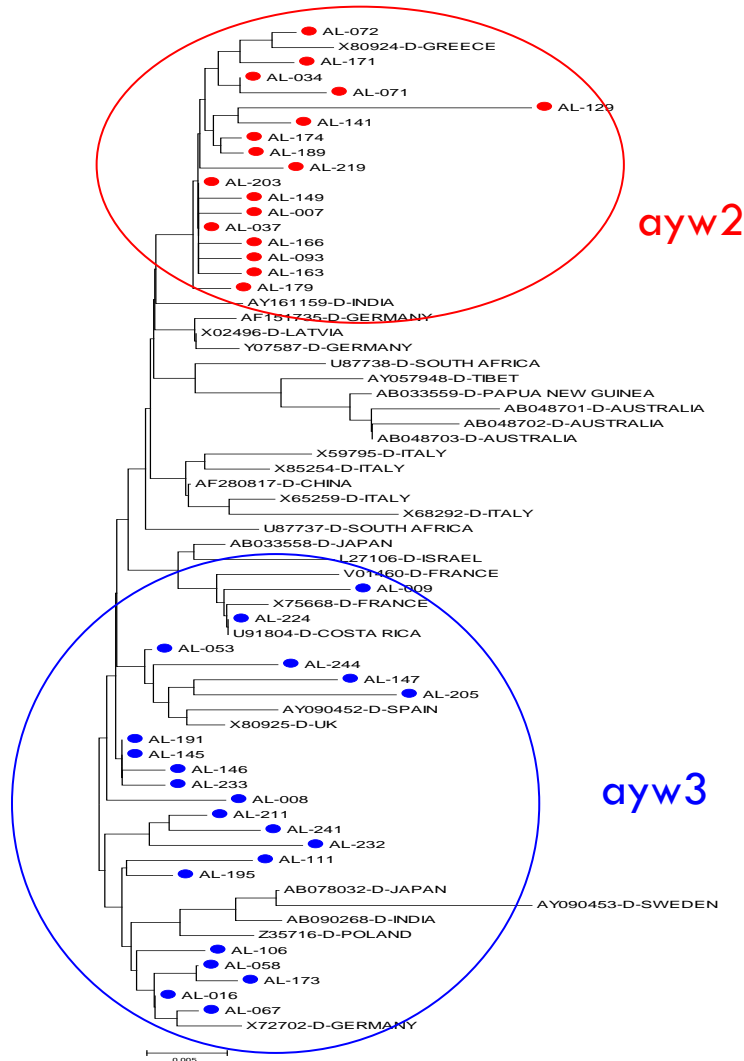


# Genotype A

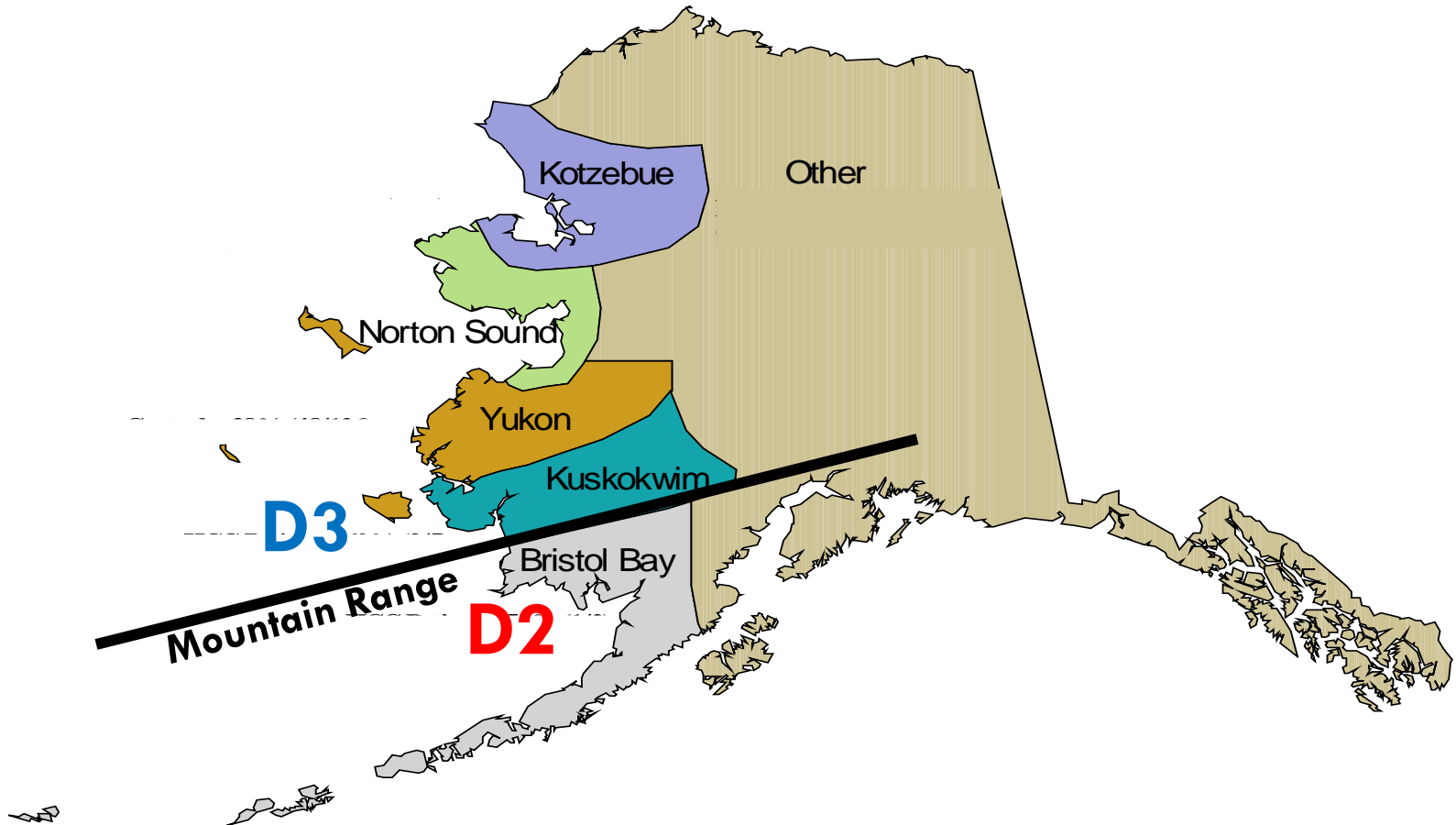


- All Alaskan genotype A strains belong to A2 subtype
  - This subtype is typical for Europe and North America
  - Encode serotype adw2
  - Highest percent of variability within 410 bp
- S-gene fragment is 2.5%

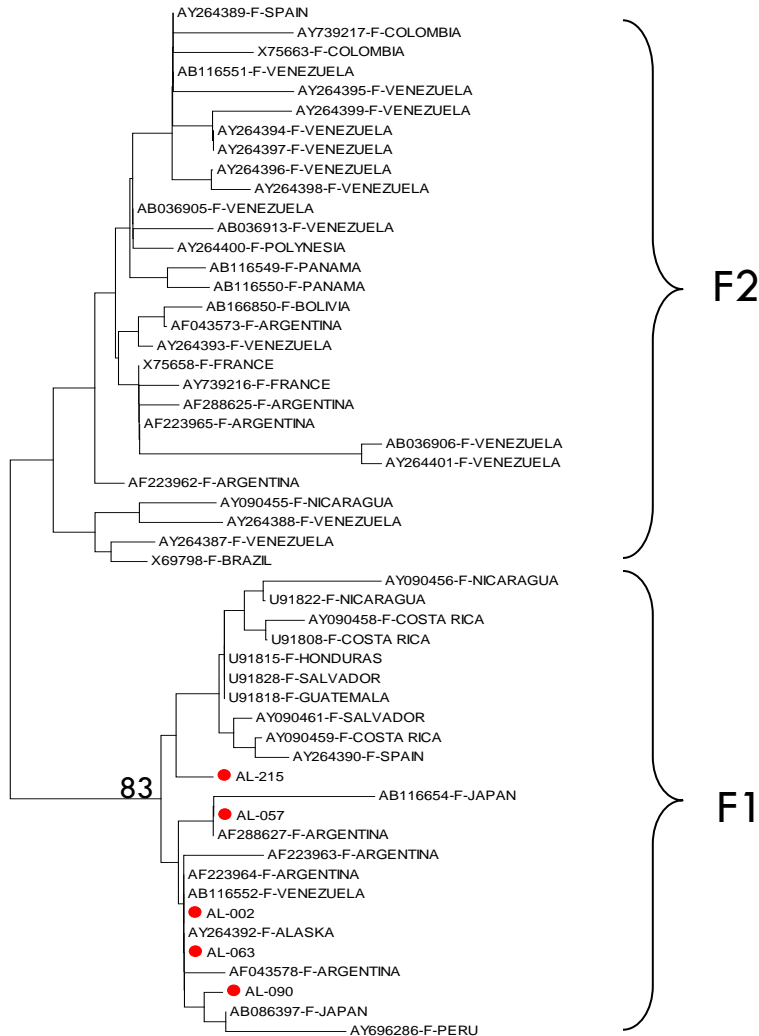
# Genotype D – Two subtypes divided



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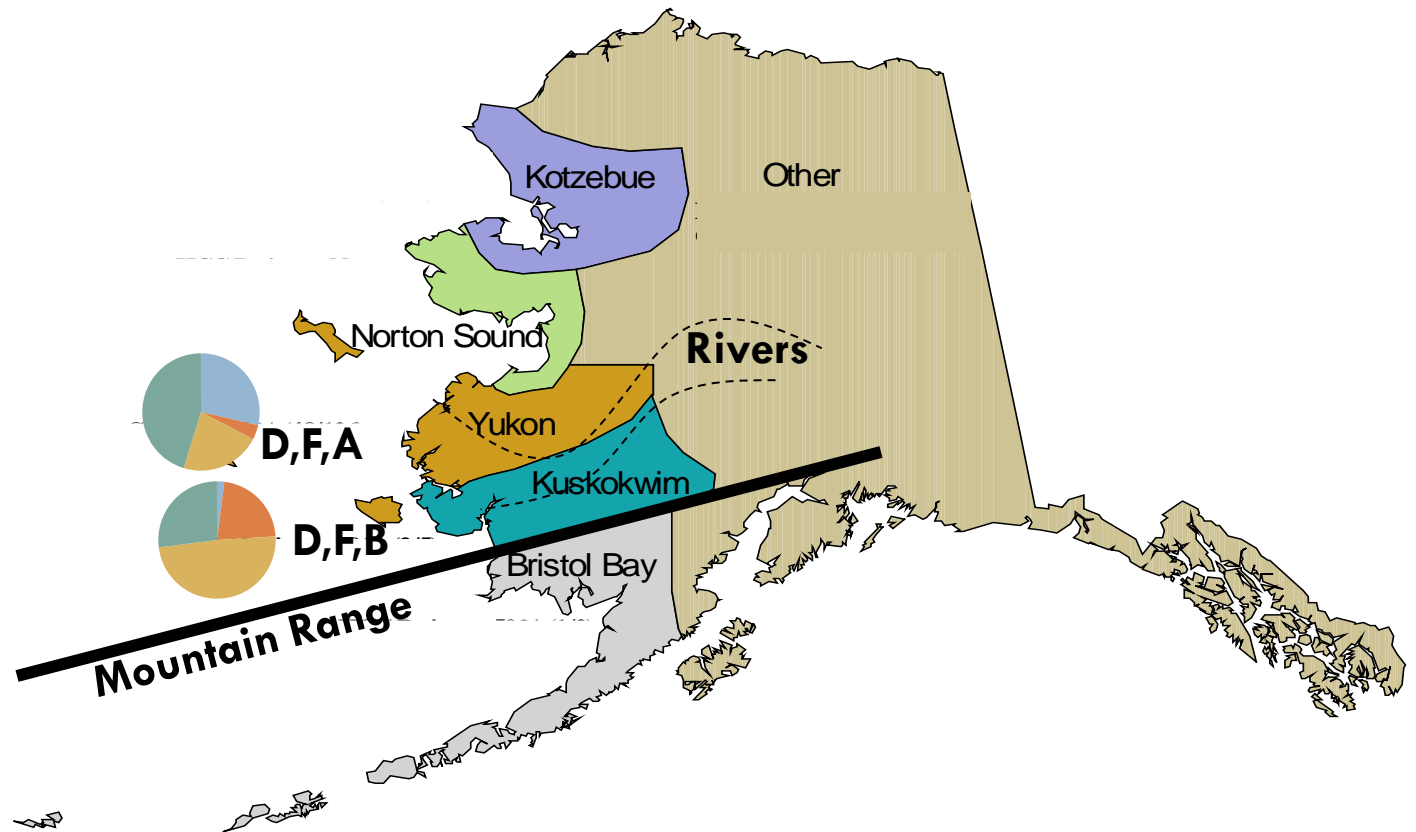
# Genotype F



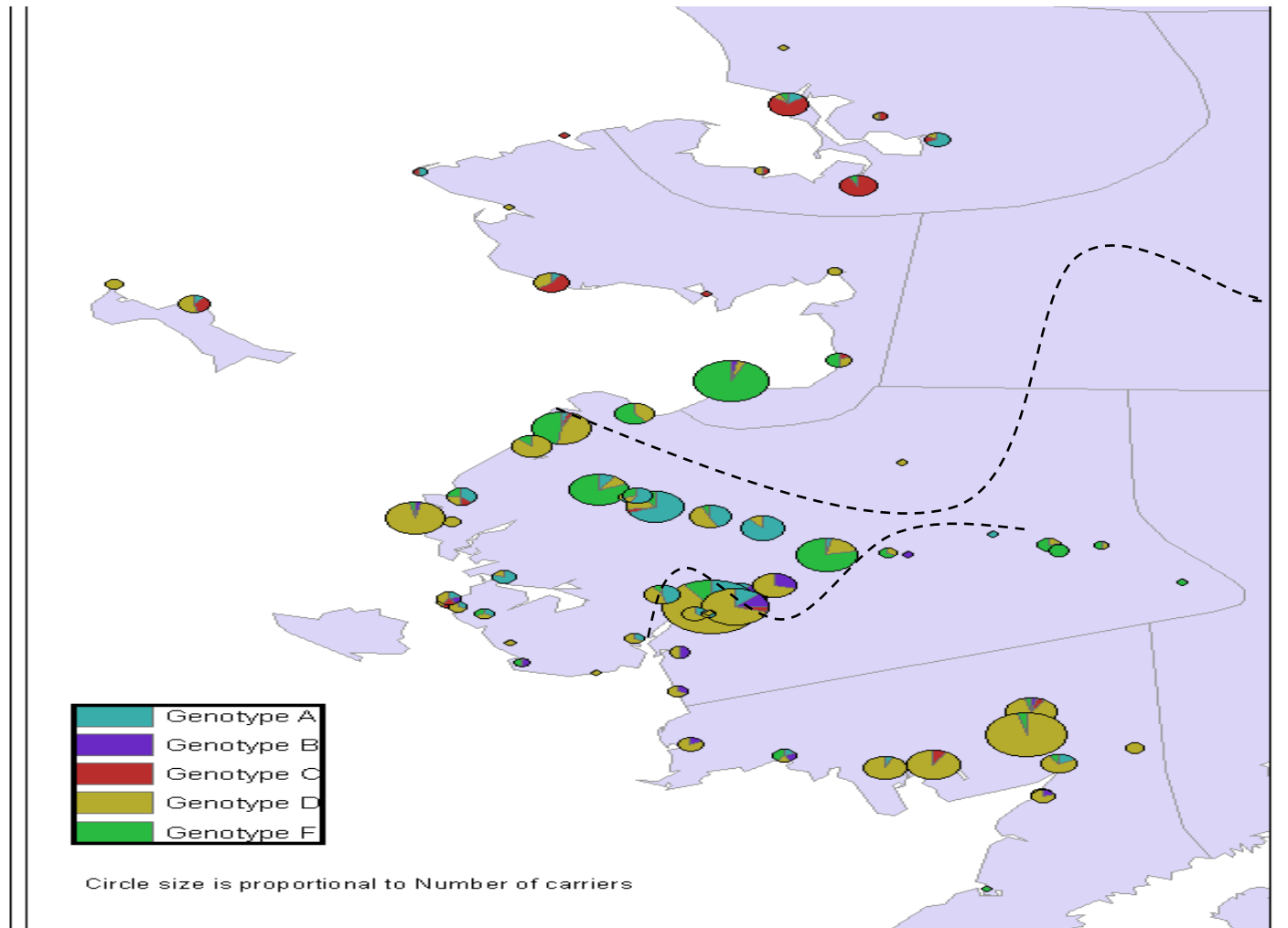
NJ, K80, S-gene, 410 bp

- Highest percent of variability within 410 bp S-gene fragment is 1.4%
- ~ 70% of strains were identical.

# Genotype F Identified Primarily in Southwest Alaska



# Migration of Genotype F throughout Southwestern Alaska



# HBV Genotype and Transmission in Alaska

- In northwest Alaska where genotype C predominates maternal infant transmission of HBV was common prior to vaccination
- In areas where genotype C was not found such as southwest Alaska, transmission was predominantly child to child through open cuts and scratches and adults through sexual exposure and perinatal transmission played a minor role.



# HBV Genotype Associations

- Genotype C associated:
  - Perinatal transmission
  - High rates of HCC compared to A2, B6 and D2,3 and cirrhosis starting age 40
- Genotype D3: Associated with HBV vasculitis which disappeared post vaccination
- Genotype F associated with HCC in children and young adults
- Genotype B6: No serious sequelae to date

# Median Age of HBeAg Seroconversion by Genotype: Median 21 Years Follow-up\*

Genotype	No. HBeAg+	Age 50% lost HBeAg	Age 75% lost HBeAg
A <sub>2</sub>	34	19.8	32.1
B <sub>6</sub>	6	19.5	27.5
C <sub>2</sub>	36	47.8	58.1
D	305	18.0	27.3
F <sub>1</sub>	126	16.1	24.5

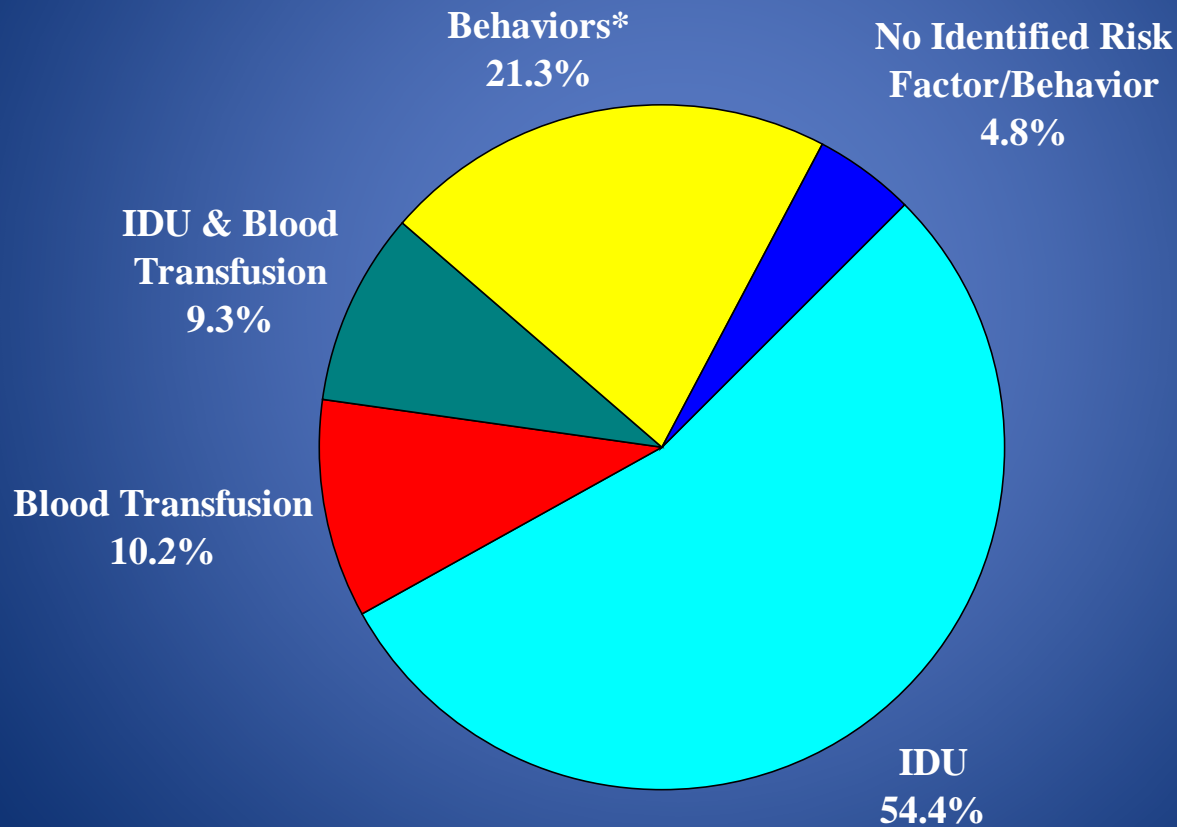
# Estimates of Chronic HBV in State of Alaska Using 2010 Census

- Alaska Population: 710,231
  - Foreign born: 6.6%
  - Asian ethnicity: 5.4% vs. 4.8% US
  - Pacific Island: 1.0% vs. 0.2% US
- Ethnicity Numbers:
  - Asian: 38,131
  - Pacific Islander: 7,400
  - Plus unknown number of Eastern European and other potential high risk groups
- B McMahon's quasi accurate estimate of number of chronic HBV in non Alaska Native persons
  - 5% infected: 2,300
  - 10% infected: 4,600

# Alaska Native/American Indian Persons in Alaska with Hepatitis C

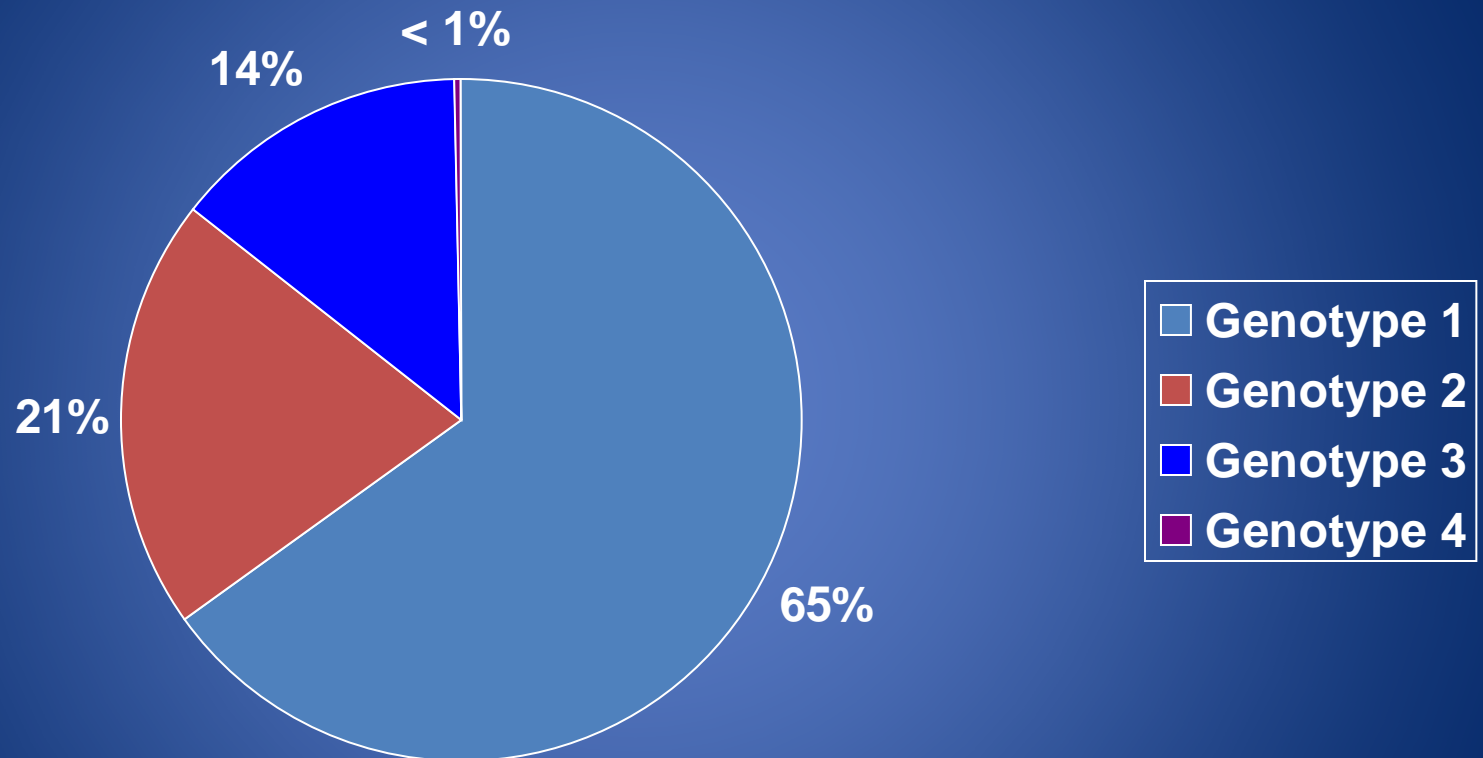
- Anti-HCV positive (living & dead) 2,300
- Anti-HCV positive (living) 1900
- Enrolled in outcomes cohort
  - 1,234 (living and dead)
  - 986 (living)
  - 967 HCV RNA positive (78.4%)
  - 260 HCV RNA negative (21.1%)
  - 7 no HCV RNA done

# Figure 1: Primary Risk Factor/Behaviors in Alaska Natives with HCV

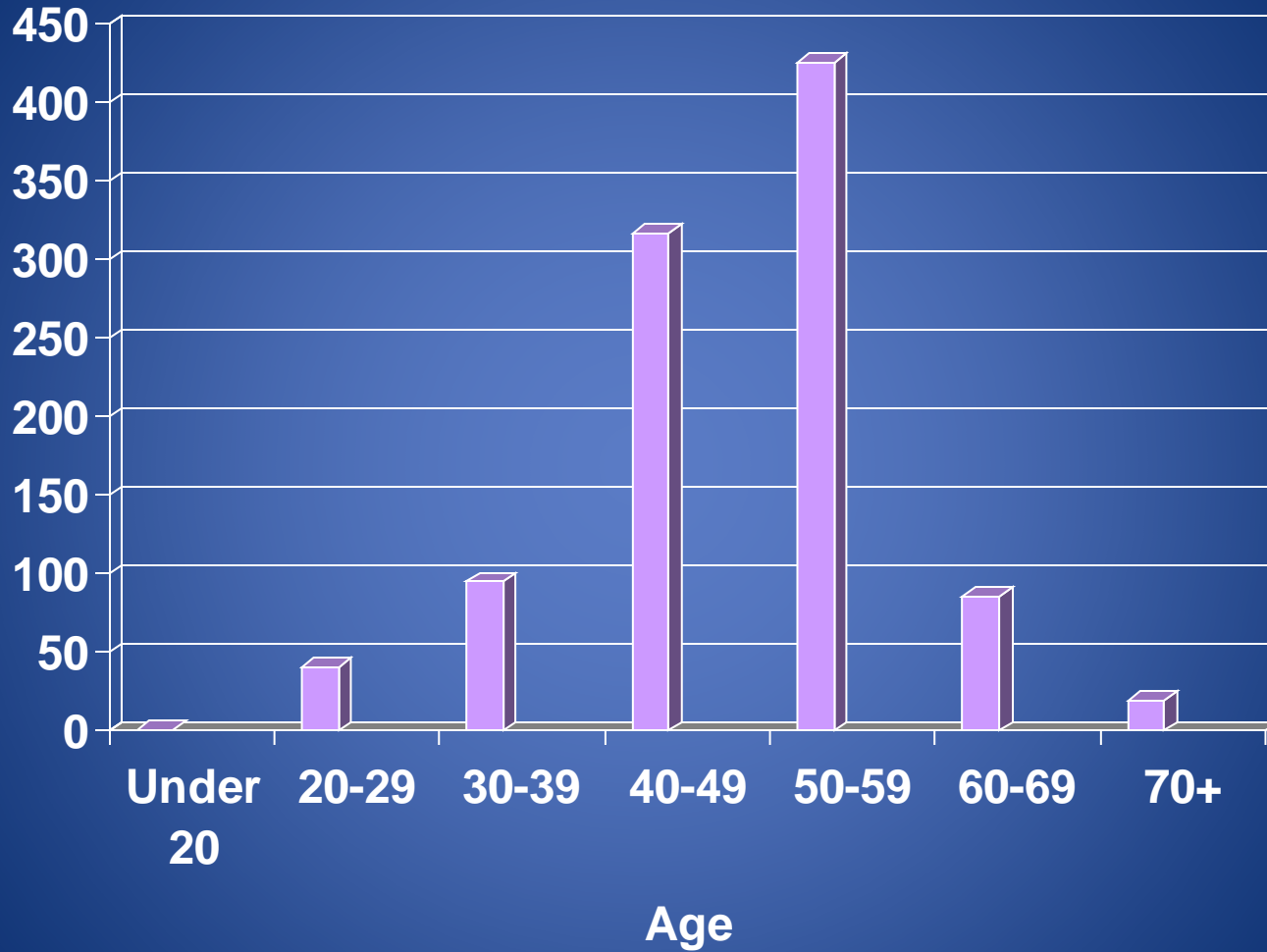


Possible High Risk Behaviors: Snorting, High Risk Occupation,  $\diamond$ 10 Sexual Partners, HCV Household Contact, Tattoo, HCV Sexual Partner, IDU Sexual Partner, Toothbrush/Razor Sharing

# Genotypes in Hepatitis C Cohort



# Age Breakdown of HCV Cohort



(86% > age 40. Mean age = 49 years. 54% female)

# Conclusions: Epidemiology of HCV in Alaska Natives

- Prevalence of HCV within NHANES estimates for US
- Risk Factor distribution same as US
- Proportion who recovered from HCV same as NHANES study
- Genotype distribution similar to NHANES except slightly increased proportion of genotype 3



# Alaska HCV Outcome Study

- Retrospective-prospective population-based study
- 960 patients followed 1994-2005
  - 695 chronic HCV; 214 recovered (RIBA +)
  - Mean years prospectively: 7.2 years
  - Mean years retrospectively: 12.1 years

# HCV Outcome Study: Initial Evaluation

- Alcohol usage measured at enrollment
  - 13% consumed  $\geq$  50gms ETOH/day
- Incidence calculated per 100 person years of follow-up
  - End stage liver disease
  - Liver related death
  - HCC
- Persons with chronic HCV were compared to those who recovered.

# Incidence End Stage Liver Disease per 100 Person Years

Factors	Chronic HCV	Recovered HCV	P Value
Alcohol $\geq$ 50 gms/day	3.21	5.69	P=0.13
Alcohol <50 gms/day	1.58	0.36	P=0.002

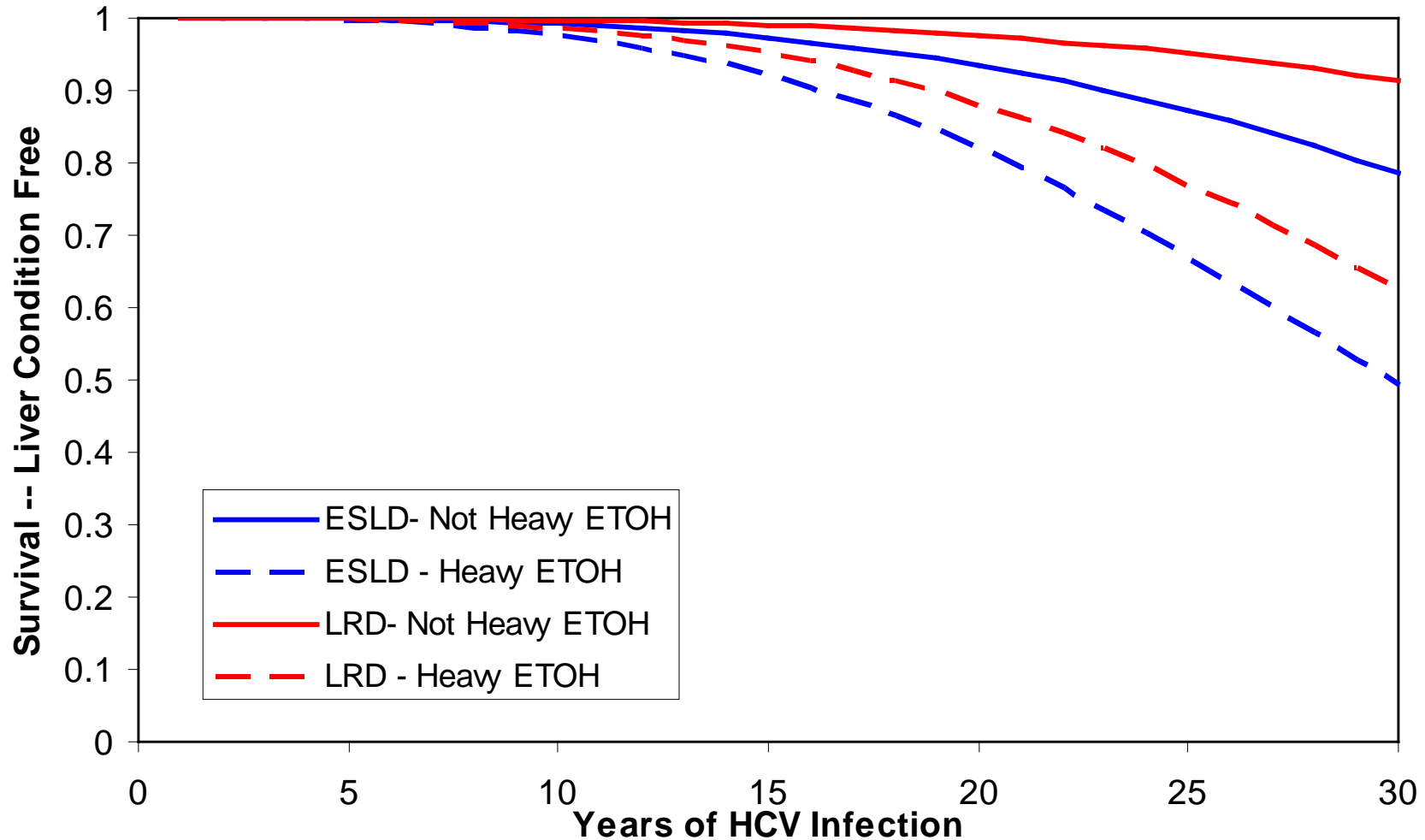
# Incidence Liver Related Death per 100 Person Years

Factors	Chronic HCV	Recovered HCV	P Value
Alcohol $\geq$ 50 gms/day	2.28 vs.	3.50	P=0.34
Alcohol <50 gms/day	0.77	0.09	P=0.01

# Mortality in Alaska Natives with HCV Infection vs. Those without

- AN persons with chronic HCV are 17 times more likely to die a liver related death than rest of the US population as a whole
- AN persons who recovered from HCV are 12 times more likely to die a liver related death than AN population

# Survival Probability for free from end stage liver disease (ESLD) or liver-related death (LRD)



Predicted probabilities are calculated for a person infected with HCV at 25 years of age

# Estimate of HCV Infected Persons in State of Alaska

- Number on non duplicate names in Alaska State database: 13,944 anti-HCV positive
  - 2,300 Alaska Native Persons (1.8%)\*
  - 11,644 non Alaska Natives (1.6 %)\*
- B. McMahon's quasi accurate estimates of HCV number and prevalence in Alaska<sup>^</sup>
  - 25% of infected identified: 55,776 (7.9%)\*
  - 50% of infected identified: 27,288 (3.8%)\*

\*Estimated population prevalence

<sup>^</sup>Rates in Alaska Natives may be lower as only 1/3<sup>rd</sup> are urban

# Conclusions:

- Alaska Natives have similar prevalence, genotypes and risk factors as US as a whole
- Alcohol is a potent co-factor in development of adverse outcomes
- State of Alaska as a whole may have a higher prevalence of HCV than US