

Insect & Vector-borne Disease Increasing Concerns for Alaska

Jeffrey G Demain, MD, FAAAI, FAAP

Director, Allergy Asthma & Immunology Center of Alaska
Associate Clinical Professor, University of Washington



Disclosures

I am not an expert on the topic of global warming.

- Research

- ◆ Genentech
- ◆ Novartis
- ◆ CSL Behring

- Speaker

- ◆ Genentech
- ◆ Novartis
- ◆ Teva
- ◆ Sanofi-Aventis
- ◆ Astra-Zeneca

I have no potential conflicts of interest relevant to this topic.

Impact on Health in Alaska



Increased Stinging and
Biting Insects



Potential Risk of
Vector Borne Disease

Vector borne diseases

Arthropod borne viruses

- ◆ Tick-borne Encephalitis
- ◆ West Nile Virus
- ◆ Northway Virus
- ◆ Snowshoe hare Virus



Emerging public health threats
in the arctic regions of Canada,
Alaska & the Russian
Federation



Vector borne diseases

Mosquitos that transmit WNV are present in the US and Canadian Arctic:

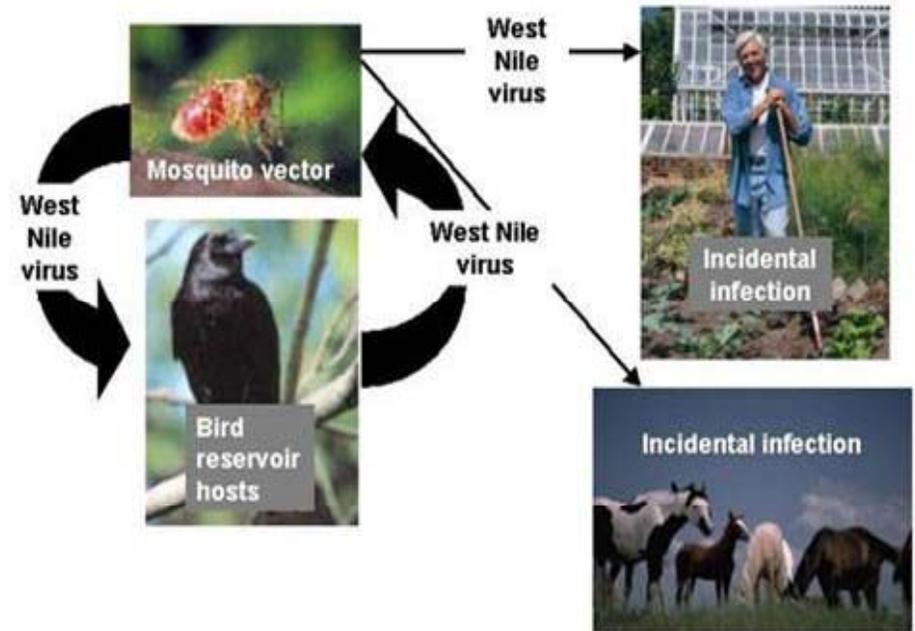
- *Aedes canadensis*
- *Aedes Vexans*
- *Culex pipiens*
- *Culex resuan*

Dead bird surveillance conducted 2000-2006 in Alaska did not identify WNV

Furthest north
57.5° Latitude N
(2004)

Adapted from Alan Parkinson PhD, CDC, Arctic Investigations Program

West Nile Virus Transmission Cycle



Tick-borne Encephalitis (TBE)



- Over the past 20 years there has been a substantial increase in TBE in Sweden and shifts in northern latitude distribution.
- This increase has been linked to global warming and a change toward **milder winters** and **earlier arrival of spring**.
 - Increases in tick prevalence and infection
- *Ixodes ricinus* is the main vector for
 - Lyme borreliosis
 - Tick-borne encephalitis



Lindgren E, Gustafson R. The Lancet, 2001;358:16-18

Tick-borne Encephalitis, Sweden

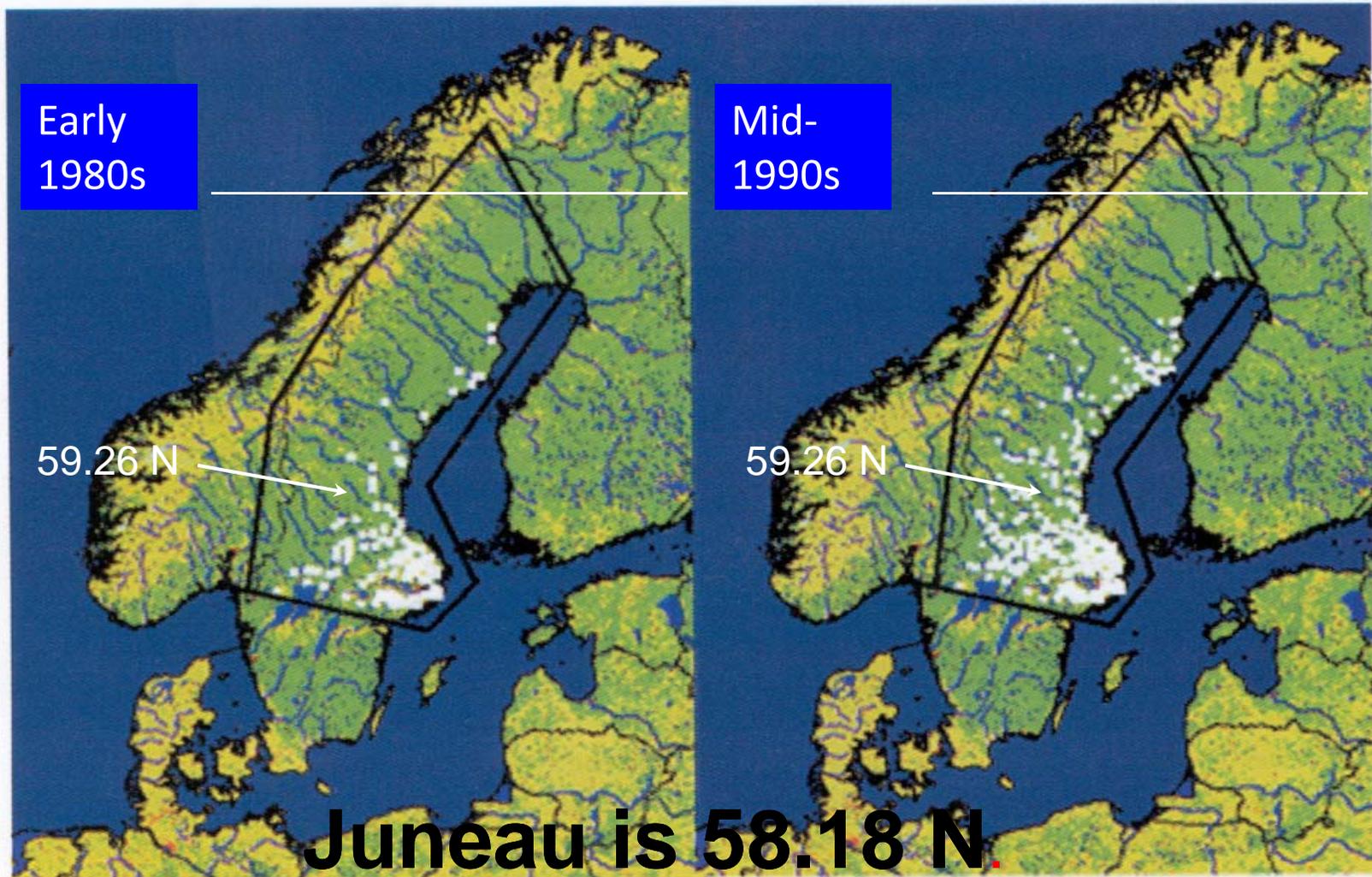


Figure 1. White dots illustrate districts in Sweden where ticks were reported to be present (A) in the early 1980s and (B) in the mid-1990s. The study region is within the black line.

Lindgren et al. 2000

Changing Patterns of Insects

Lepidopterism in Alaska

Caterpillars make Silky pickers' skin crawl



LIFE Health

CATERPILLAR: *Aeropy pickers' believe "hairy" insect is causing rash*

The text in this block is mostly illegible due to low resolution, but it appears to be a news article snippet from LIFE magazine's Health section, discussing a rash caused by a hairy caterpillar.



Hymenoptera Related Deaths in Alaska

- 2 deaths from hymenoptera stings in Fairbanks during the summer of 2006

FAIRBANKS
Daily News-Miner
 The voice of Interior Alaska since 1903
 MONDAY, JULY 10, 2006
 75 cents

Yellowjacket sting suspected in man's death

By MARGARET FRIEDENAUER and ROBINSON DUFFY
 Staff Writers

A Fairbanks man died Saturday after apparently suffering an allergic reaction to a yellowjacket sting and attempting to drive himself to the hospital.

Zachary M. Warwick, 29, was pronounced dead at Fairbanks Memorial Hospital on Saturday evening. Emergency personnel with Fairbanks Police and Fire Department transported Warwick to the hospital after responding to a single vehicle accident near Ryan Middle School.

Warwick was unconscious at the scene and having respiratory difficulties.

Police on Saturday said Warwick's 2005 GMC Sierra Pickup was surprisingly intact with only moderate front-end damage after the lost consciousness and drove through two fences near Ryan Middle School. Officers said he was not injured in the crash.

According to his sister, Sydney Morgan,

“He was a generous man. Someone we should all strive to be.”

—Sydney Morgan, sister of Zachary Warwick

Warwick likely was stung at his Glacier Avenue home Saturday afternoon, suffering an allergic reaction and drove to the hospital for treatment.

Warwick was asthmatic, Morgan said, and had his inhaler with him in his vehicle. Morgan said when family members went to her brother's home Sunday, they found the last Web search on his computer was for symptoms and treatment of wasp stings.

Warwick was born and raised in Fairbanks along with Morgan and brother Jesse

Warwick. He graduated from Lathrop High School in 1995. During high school, Zachary represented Alaska on the Junior Olympics Alpine Ski Team.

Along with parents, Andy and Judy, the family spent much of their free time at their Harding Lake cabin.

“He loved to be out (at Harding Lake),” said family friend Jeff Cook on Sunday. “Whether it was out on the water or on his snowmachine. He was a very outdoor oriented boy.”

Warwick earned a business degree from Montana State University and was working toward an accounting degree at University of Alaska Fairbanks. He worked at Warwick & Schkora CPAs.

Morgan said her brother enjoyed being around friends and family and taking care of things like getting food ready for gatherings or making sure gas tanks were filled on boats or snowmachines so the vehicles would

Department arrived within five minutes and took her husband to Fairbanks Memorial Hospital, Monica said. Monica and doctors had a hard time getting a hold-down his throat because of his swelling, she said.

An hour and a half later, doctors told Monica her husband was dead.

“The doctor told me from the moment he got stung there was nothing that could have been done,” said a distraught Monica on Friday. “He said it wouldn't have mattered if I got the EpiPen on his right time.”

The death of her husband was a shock to Monica, she said. “I think this is an anomaly for our community,” she said, saying that the chance of dying from a sting are low after being struck and killed by lightning.

About 50 people die from bee or wasp stings each year in the United States, said Potts.

In the case of both her husband

Photo courtesy of the Warwick family

ZEST FOR LIFE—Zachary M. Warwick, 29, poses with his dog Boots during a Fourth of July celebration held last week.

See DEATH, Page A6

FAIRBANKS
Daily News-Miner
 The voice of Interior Alaska since 1903
 SATURDAY, AUGUST 26, 2006
 75 cents

Wasp sting blamed for second death in Fairbanks

By TIM MOWRY

A second man has died from a wasp sting this summer in Fairbanks.

Matt Bur, a 39-year-old Fairbanks truck driver, died Tuesday shortly after getting stung by a yellowjacket at his home off Florence Loop, according to his wife, Monica.

It was the second death this summer in Fairbanks attributed to yellowjacket stings. Zachary Warwick, 29, died of anaphylactic shock July 9 after getting stung while working in the yard of his Hamilton Arms home. Warwick died while trying to drive himself to the hospital.

Anaphylaxis is a severe and rapid multi-organ allergic reaction that occurs when a person is exposed to a trigger substance, such as bee or wasp venom. It is potentially fatal because it can cause rapid constriction of airways if left untreated.

Matt Bur's pronounced allergic reaction to yellowjackets at around 2:30 p.m. He was pronounced dead at Fairbanks Memorial Hospital about an hour and a half later, said his wife of 21 years.

“We were down in our driveway cutting trees during around, waiting at the back of his truck,” said Monica Bur, who was holding a running chainsaw at the time.

A yellowjacket sting him in the back of the neck and the sting was still visible, she said. But the sting didn't seem to bother her husband, Monica said. He took his shirt off and walked over to start the chainsaw off before showing her the sting.

“It didn't swell or anything,” she said. “Though she had an EpiPen, an emergency shot of epinephrine used to treat allergic reactions to stings, because she developed a rash one time after getting stung, Monica didn't bother getting it because her husband had been stung several times before and had never had a problem.”

See STING, Page A8

STING: Second death attributed to bees unprecedented

Continued from Page A1

“He just got stung two weeks ago and he got stung two weeks before that and nothing ever happened,” said Monica. “He got stung every summer.”

She advised him to get some baking soda on the sting.

“Maybe two minutes later he just all of a sudden looked like he had died and,” then, this thing really hurts,” she said.

Almost immediately, he began wheezing and went down on all fours, she said. That's when Monica ran to the house for the EpiPen.

“I never even gave a moment and when I came out to see at the top of the driveway face down,” she said. “He wasn't breathing. He was already blue.”

Herself, Monica called 911 and told the dispatcher her husband had been stung by a wasp and couldn't breathe. She had trouble figuring out how to work the EpiPen but after three tries was able to jab it into his upper thigh, she said. Then she started hearing an ambulance siren heading in his chest and screaming for help.

An ambulance from the University of Alaska Fairbanks Fire

Department arrived within five minutes and took her husband to Fairbanks Memorial Hospital, Monica said. Monica and doctors had a hard time getting a hold-down his throat because of his swelling, she said.

An hour and a half later, doctors told Monica her husband was dead.

“The doctor told me from the moment he got stung there was nothing that could have been done,” said a distraught Monica on Friday. “He said it wouldn't have mattered if I got the EpiPen on his right time.”

The death of her husband was a shock to Monica, she said. “I think this is an anomaly for our community,” she said, saying that the chance of dying from a sting are low after being struck and killed by lightning.

About 50 people die from bee or wasp stings each year in the United States, said Potts.

In the case of both her husband

Warwick, it was the first time either had shown an allergic reaction to a sting. That's the case in about half the deaths attributed to bee and wasp stings, those said.

Fairbanks is experiencing its worst summer in more than a decade for wasps, both yellowjackets and bald-faced hornets, according to experts. That fact is borne out by the number of sting victims showing up at the emergency room, said Dr. Eric Stirling, the emergency room physician at Fairbanks Memorial Hospital who treated Bur.

“The number of bees and the number of people that have been stung has been increasing,” according to Stirling, who has treated dozens of sting victims.

“Different people have different reactions to stings, he said. “One person might get a little swelling around the sting area, one person might get hives, one person might be wheezing, and one person might be in shock in three minutes,” said Stirling.

Stirling said that he needed to put one sting victim on a respirator within 10 minutes this summer.

Anaphylaxis is characterized by a systemic reaction away from the sting site. For example, if someone gets stung in the foot and they begin vomiting or their tongue begins to swell up, they are experiencing anaphylaxis.

Just because someone has been stung several times before and never had a reaction doesn't mean they are immune to anaphylaxis, said Stirling.

“You may have taken penicillin a dozen times and the 13th time you break out in hives and have a hard time breathing,” Stirling said. “You just never know.”

Monica Bur described her husband as “a fishing fool.” Though he was gone on a fishing week trip from the road, she said. By the time she called for help, he was that level but every day.

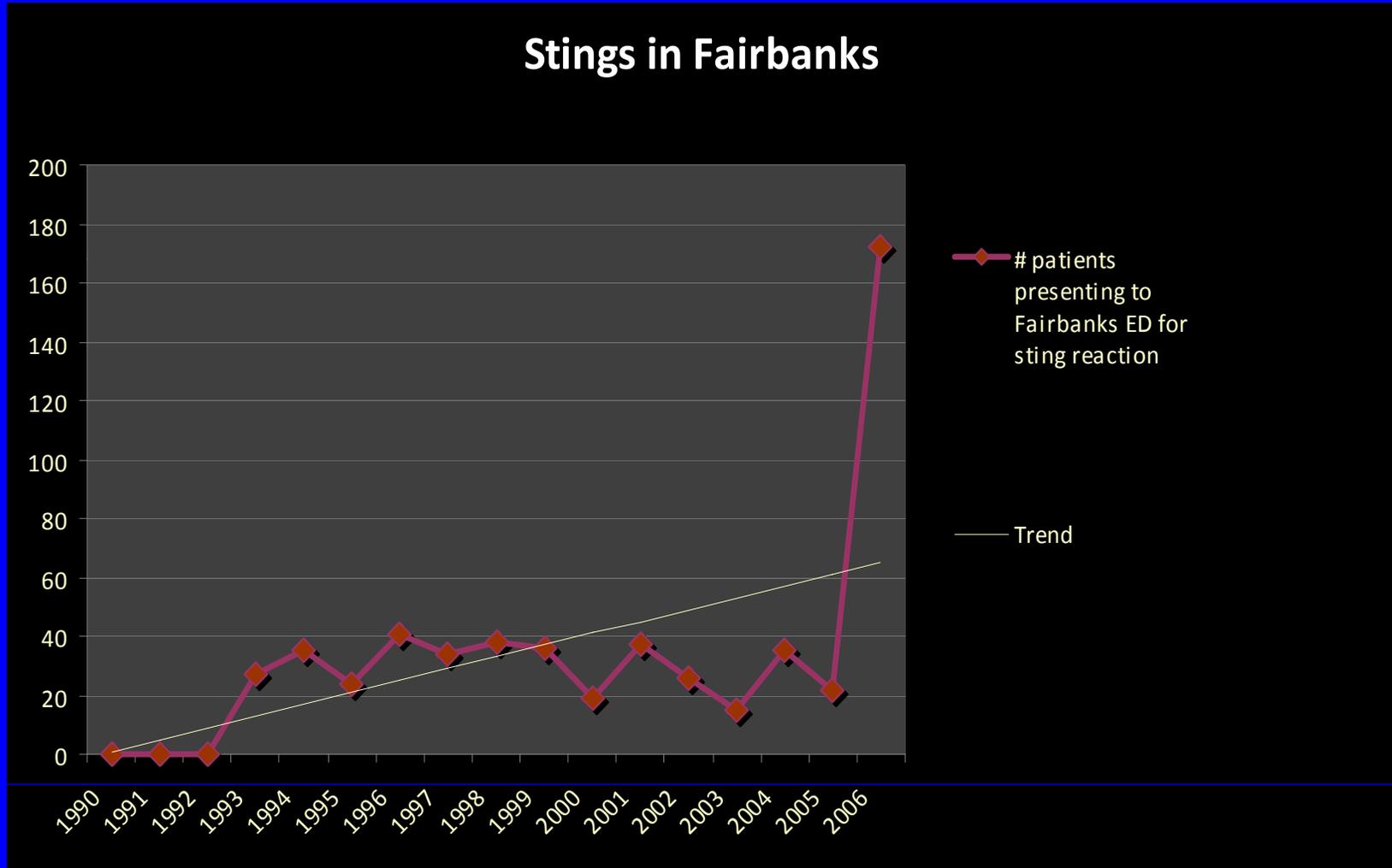
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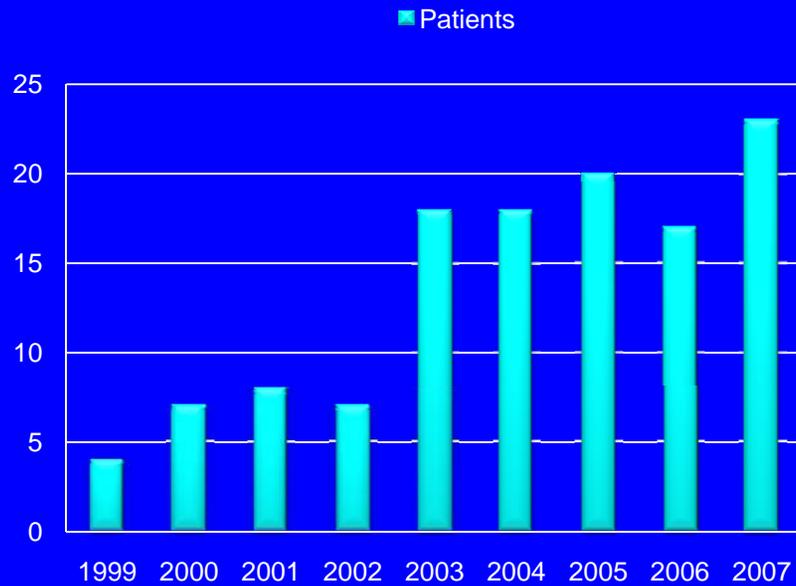
Anaphylaxis is characterized

Demain, J. G. & Gessner, B. D. Increasing incidence of medical visits due to insect stings in Alaska. *Alaska Epidemiology Bulletin* 13 (2008)

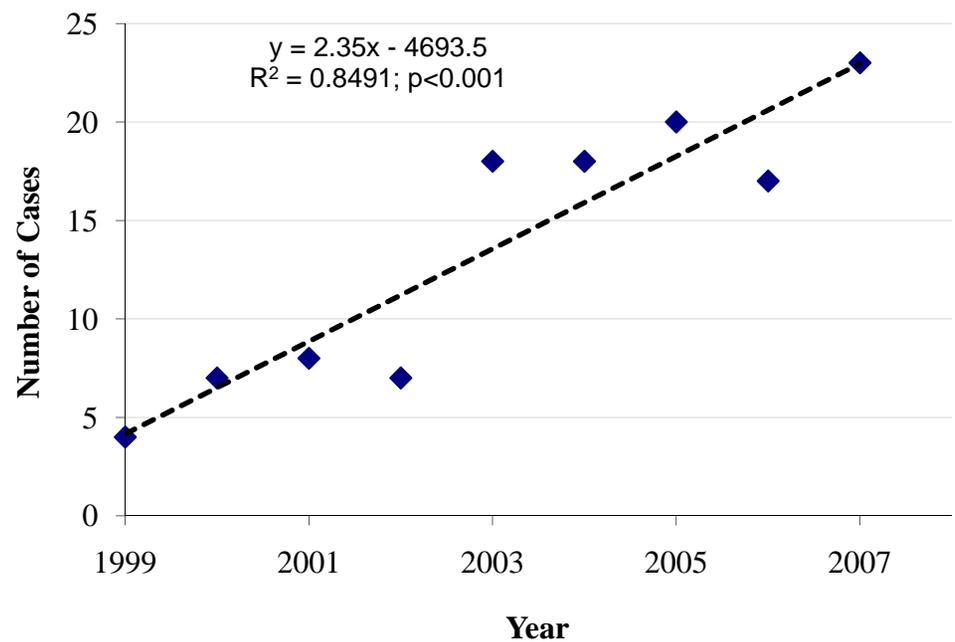
Increase in ED visits for Stings at Fairbanks Memorial



Venom Reactions

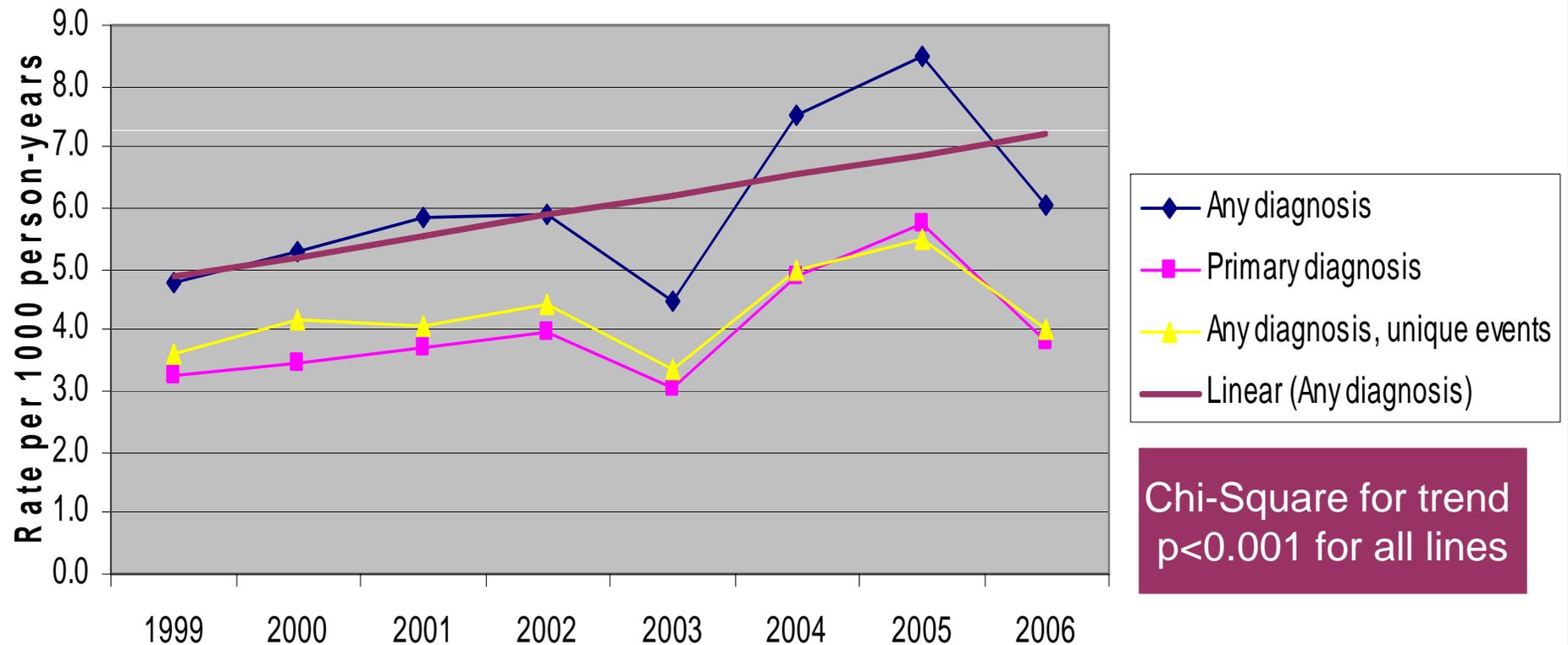


Patients Referred to AAIC for Evaluation of Sting Reactions

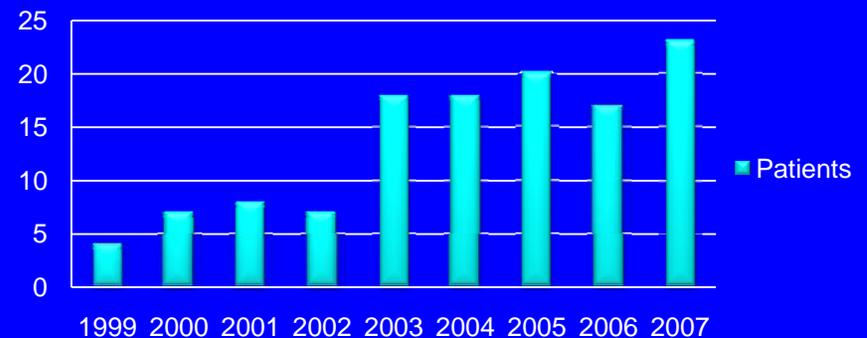
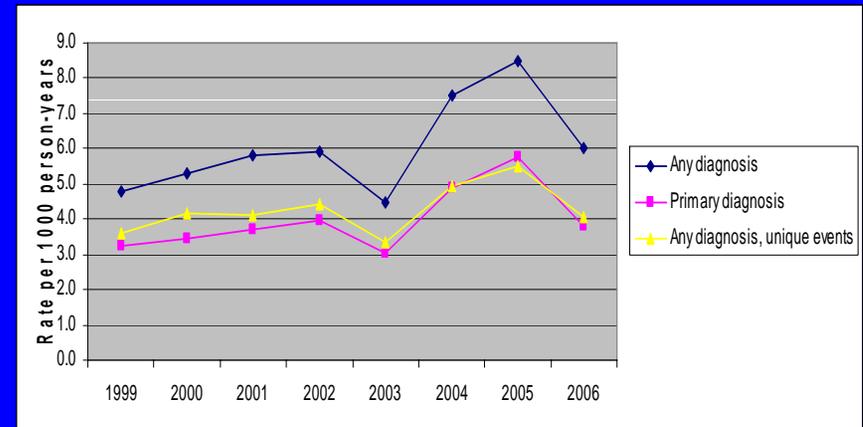
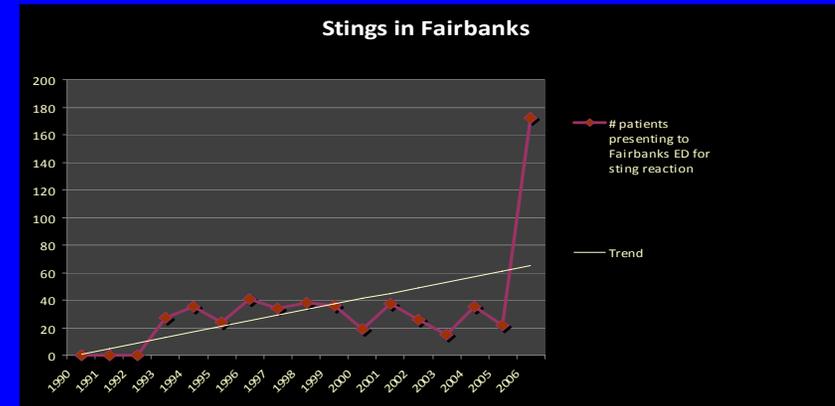
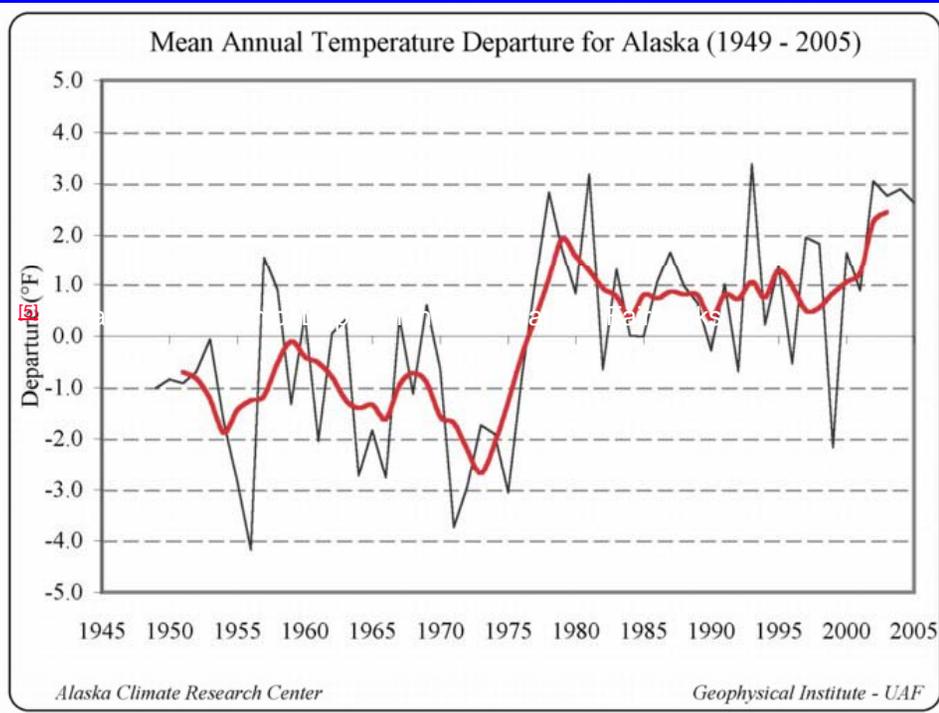


AAIC reported an average increase of 2.5 cases per year (chi-square for linear trend $p < 0.001$)

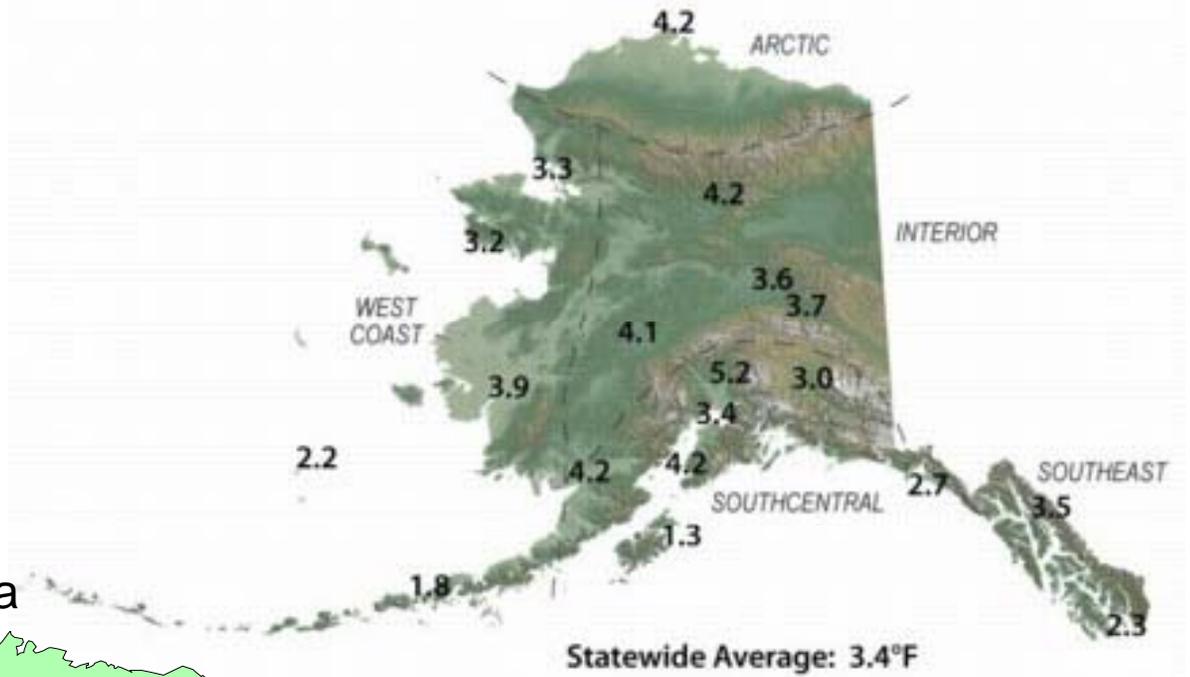
Increase in Medical Visits for Stings Among Alaska Medicaid Recipients (Over 132,000)



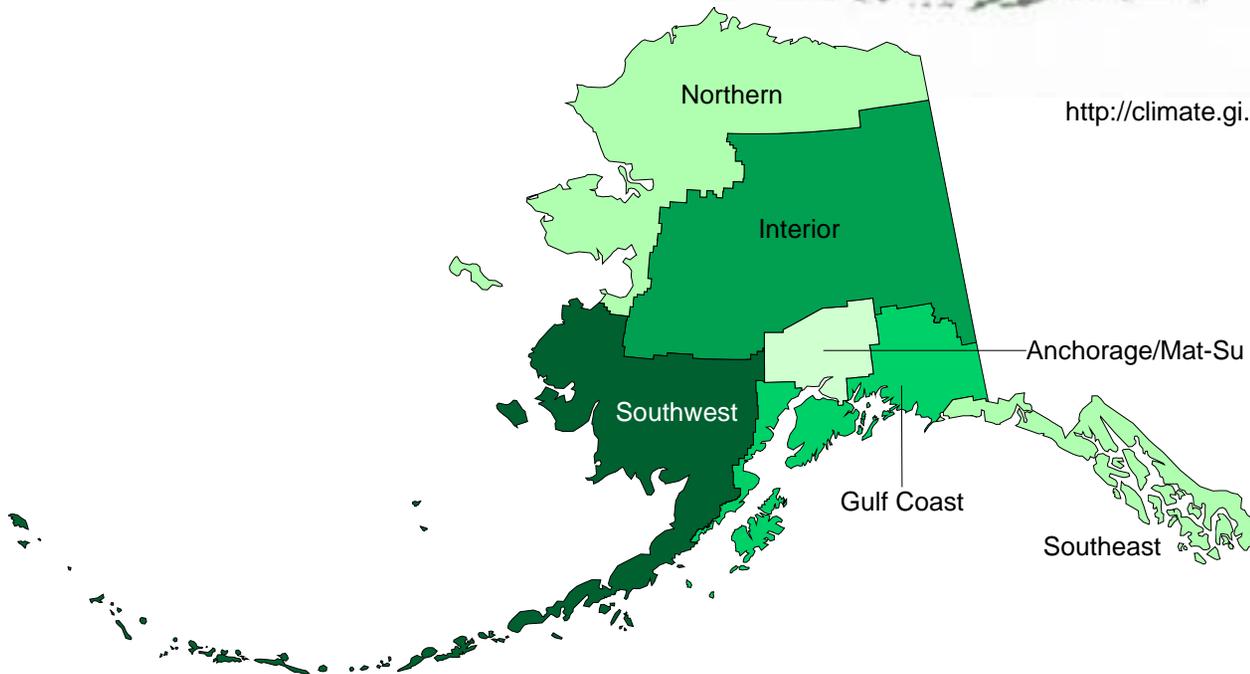
Does temperature change correlate with changing patterns of hymenoptera ?



Total Change in Mean Annual Temperature (°F), 1949 - 2007



Epidemiologic Regions of Alaska



<http://climate.gi.alaska.edu/ClimTrends/Change/TempChange.html>

Region	Largest Community	Annual temperature Increase*	Winter temperature Increase*	1999-2001 insect sting incidence[†]	2004-2006 insect sting incidence[†]	Percent change in insect sting incidence (X² for trend, p-value)[‡]
Northern	Barrow	3.8	6.1	16	119	626% (13, p<0.001)
Southwest	Bethel	3.7	6.9	62	133	114% (8, p=0.005)
Interior	Fairbanks	3.6	8.1	333	509	53% (28, p<0.001)
Southcentral	Anchorage	3.4	7.2	276	405	47% (22, p<0.001)
Southeast	Juneau	3.6	6.8	221	279	27% (22, p<0.001)
Gulf	Kodiak	1.5	1.5	437	487	11% (0.1, p=0.75)
Statewide		3.4	6.3	254	364	43% (54, p<0.001)

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Results

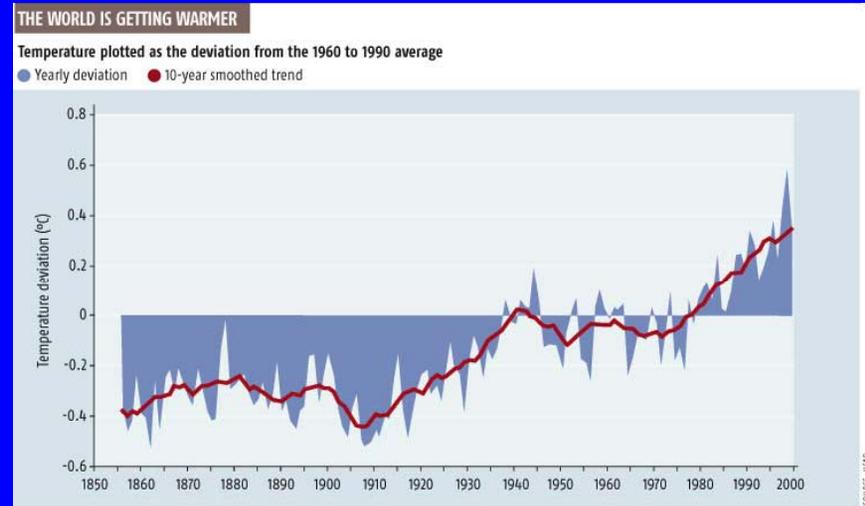
- Each of the three databases revealed an increasing trend for patients seeking medical care for bites & stings ($p < 0.001$)
- From 1999 to 2006
 - Fairbanks Memorial a 4 fold rise in 2006 from the previous years
 - AAIC had a 3 fold rise in 2003-2007 compared with 1999-2002
 - Medicaid recipients had a significant rise from 1999 through 2006
- A 6.4% population increase from 2000 to 2006 based on US Census Bureau data does not account for these observations
 - 2000 (626,932) versus 2006 (670,053)
- The determinants of insect bites & stings are complex but likely influenced by temperature increases, particularly winter temperatures.

Distribution or Survival of Insects

- Arthropods are extremely temperature sensitive
- Climate changes have impacted life cycles and expanded inhabitable territory
 - Mosquitoes and plant communities are migrating to higher ground as permafrost thaws and glaciers retreat
 - Beetle plagued forests in Alaska have impacted over 4,000,000 acres
 - Lepidoptera are expanding their northern boundaries in the northern hemisphere
 - Ticks (*Ixodes ricinus*) that transmit Lyme borreliosis and viral encephalitis have extended northwards in Sweden associated with fewer winter days below 10 degrees and more summer days above 50 degrees

Climate Change and Insects in the Arctic

- The average Arctic temperature have increased at almost twice the rate of the rest of the world in the past two decades the Arctic may serve as a sentinel site for early detection of changes in the epidemiology of infectious diseases due to climate change



The Arctic: Our Window to the Future?

