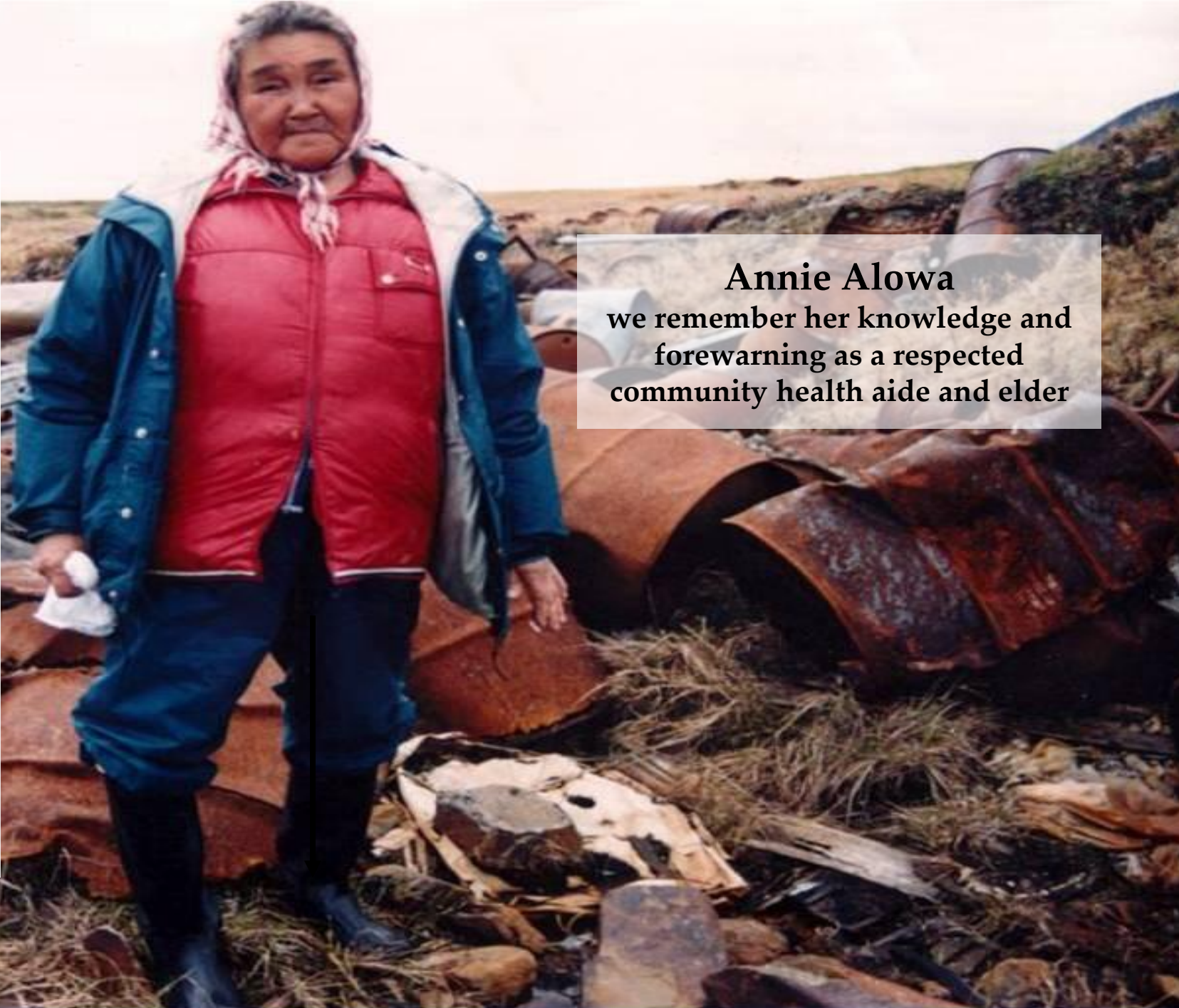


# Protecting the Health of Future Generations Through Community-Based Research and Actions



- She was a keen and trained observer about the health of her people
- She observed higher rates of cancers among the people whose families lived and worked at Northeast Cape
- She witnessed other health disparities, including miscarriages and low birth weight babies, especially among those families closely associated with Northeast Cape
- She inspires our work everyday!

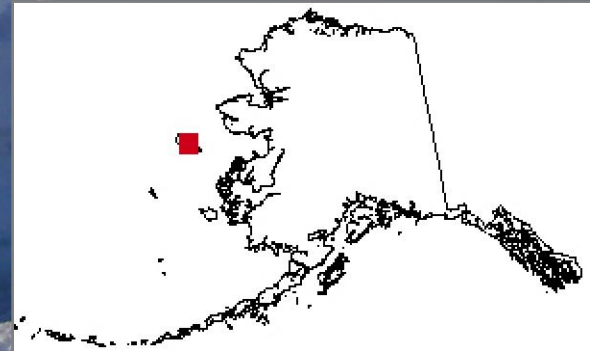
**Annie Alowa**  
we remember her knowledge and  
forewarning as a respected  
community health aide and elder



# Where is Sivuuqaq?



Located in the Northern Bering Sea



- White Alice Communication Site, operational 1957-1972
- Above ground structures & debris largely removed
- More than \$125 million spent on site remediation



# Community-Based Research on Sivuqaq, Alaska

- Elder interviews
- Bird eggs (murre) (PCBs, pesticides)
- Human blood serum (PCBs, PBDEs, OP flame retardants, pesticides, PFAS)
- Air (PCBs, pesticides)
- Groundwater (VOCs)
- Surface water (PCBs, PAHs, pesticides)
- Edible plants (PCBs, pesticides)
- Sediment cores (PCBs, pesticides, trace metals)
- Traditional foods (PCBs, pesticides, PBDEs, PFAS, metals)
- Stickleback as sentinel species
  - (PCBs, pesticides, PBDEs, PFAS)
- Community health surveys
- Community Cancer Registry
- Household dust (PBDEs, OP flame retardants, PFAS)



# Health Disparities

*“Diseases never or rarely seen before in our people...”*

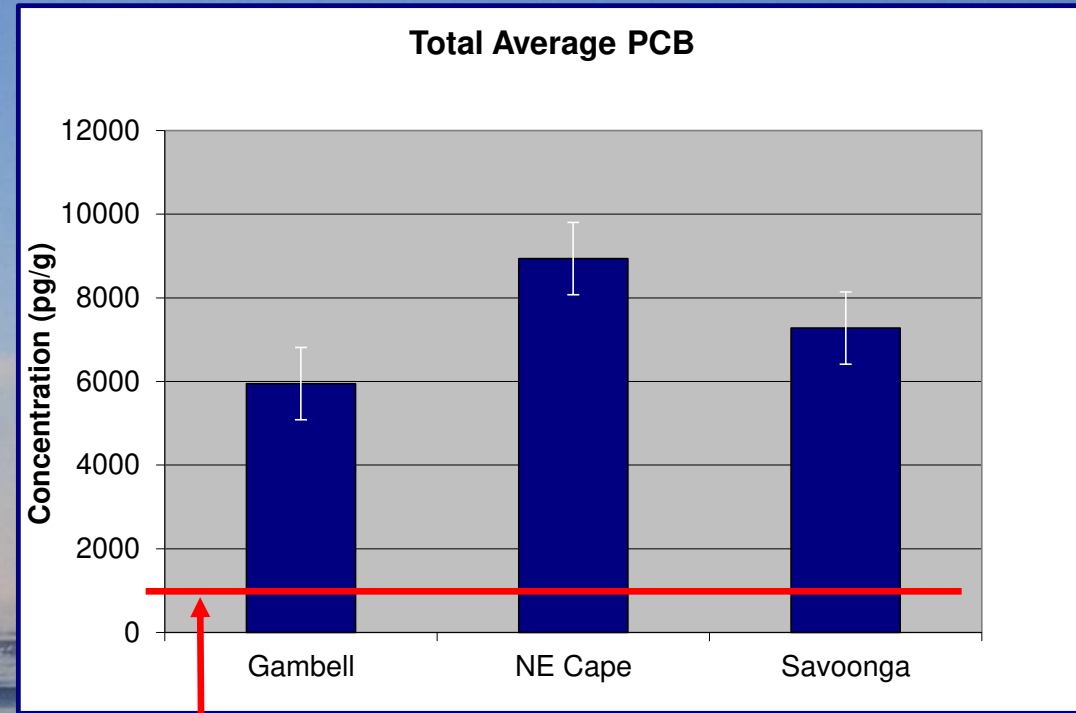
- **Cancers:** *“drastically increasing in our people since the military occupation; a cancer crisis”*
- **Thyroid disease**
- **Diabetes**
- **Heart disease**
- **Birth defects, low birthweight babies, premature births, stillbirths, miscarriages; and other reproductive health problems**
- **Developmental and learning disabilities**



# PCBs in Blood Serum of Sivuqaq Yupik People

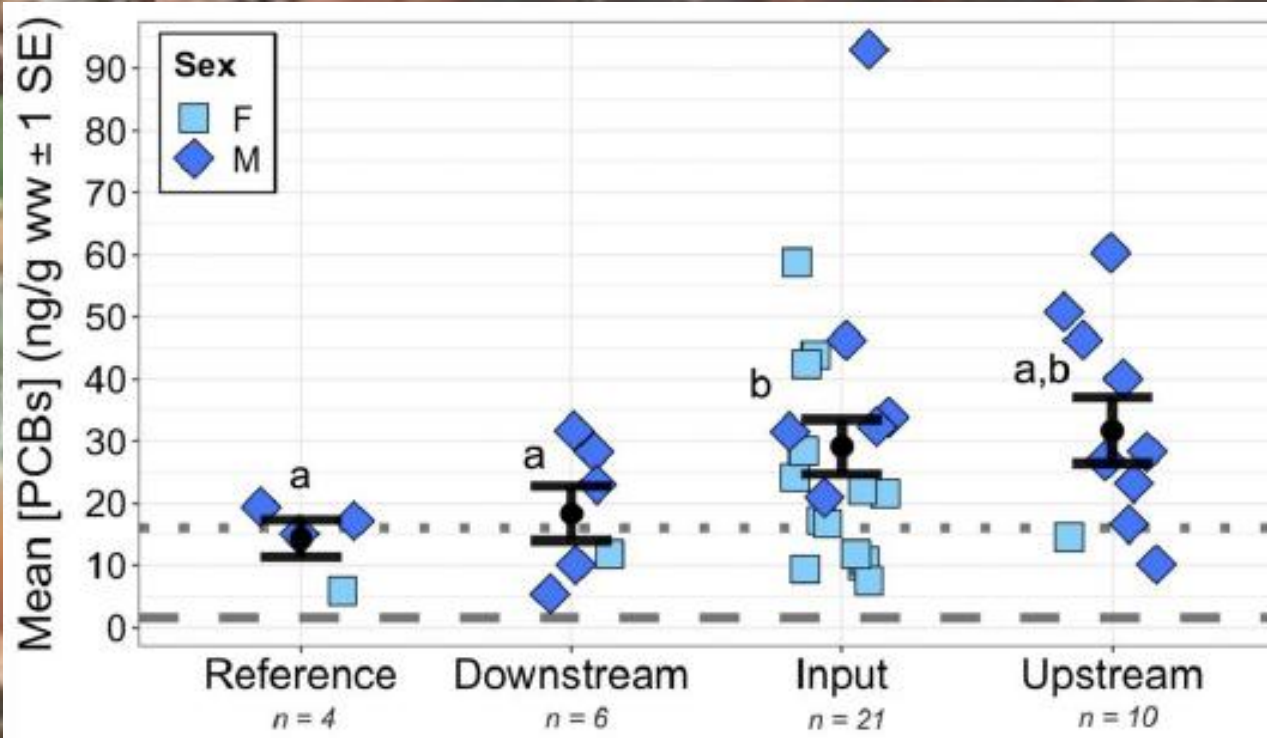
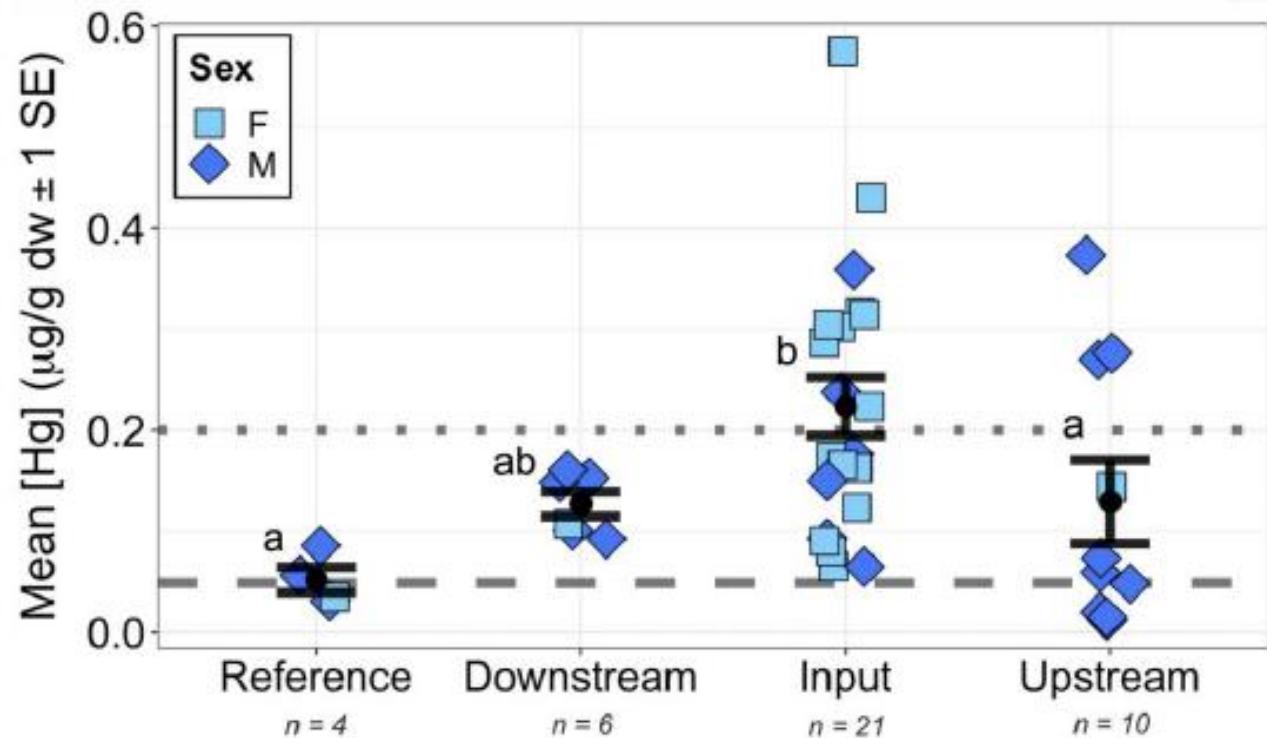
- Levels of PCBs in the blood of St. Lawrence Island Yupik people **4.5-9 times higher** than average in lower-48 populations
- Evidence of PCBs accumulating in the Arctic via global transport
- Military contamination also a significant source

Published in the *International Journal of Circumpolar Health*, 2005



*Average for populations in the Lower 48*

Elevated mercury and PCB concentrations in Dolly Varden (*Salvelinus malma*) collected near a formerly used defense site on Sivuqaq, Alaska



Ward et al. 2022, STOTEN

# Protecting Future Generations: key findings concerning sentinel fish species

- Despite extensive site remediation of the former military site at NE Cape, stickleback and blackfish remain heavily contaminated with PCBs.
- PCBs are disrupting endocrine function of fish (thyroid, reproductive) and decreasing expression of genes important in repairing gene mutations.
- Vitellogenin concentrations in male stickleback indicate exposure to estrogenic contaminants (such as certain PCB congeners).
- Widespread health disruption in the fish is consistent with health problems of people on the island. Stickleback are an important sentinel species.
- Even after site remediation, contaminants from Cold War FUD sites in remote regions of the Arctic remain a potential health threat to local residents, in this case, Yupik people who had no influence over site selection and use by the United States military.
- Exceptionally high levels of PBDEs (especially BDE-47) and PFAS (especially PFOS and PFNA) in stickleback of Troutman Lake indicate local source, such as landfills.



# Protecting Future Generations: Key findings concerning human exposures

- Six PBDEs were detected in 100% of the serum samples and another ten were present in 95% of the serum samples.
- Serum PBDEs are higher than those of Canadian Inuit.
- PFOS and PFNA were detected in more than 98% of the serum samples and PFOA was detected in 92% of the samples.
- Serum PFAS comparable to levels in the U.S. general population, however PFNA and PFUnDA elevated.
- We demonstrated that certain PBDE congeners and PFAS disrupt thyroid homeostasis.



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- Byrne, SC, PK Miller, S Seguinot-Medina, V. Waghiyi, CL Buck, FA von Hippel, DO Carpenter. 2017. Associations between serum polybrominated diphenyl ethers and thyroid hormones in a remote Alaska Native population. *Environmental Pollution* 231: 387-305.

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