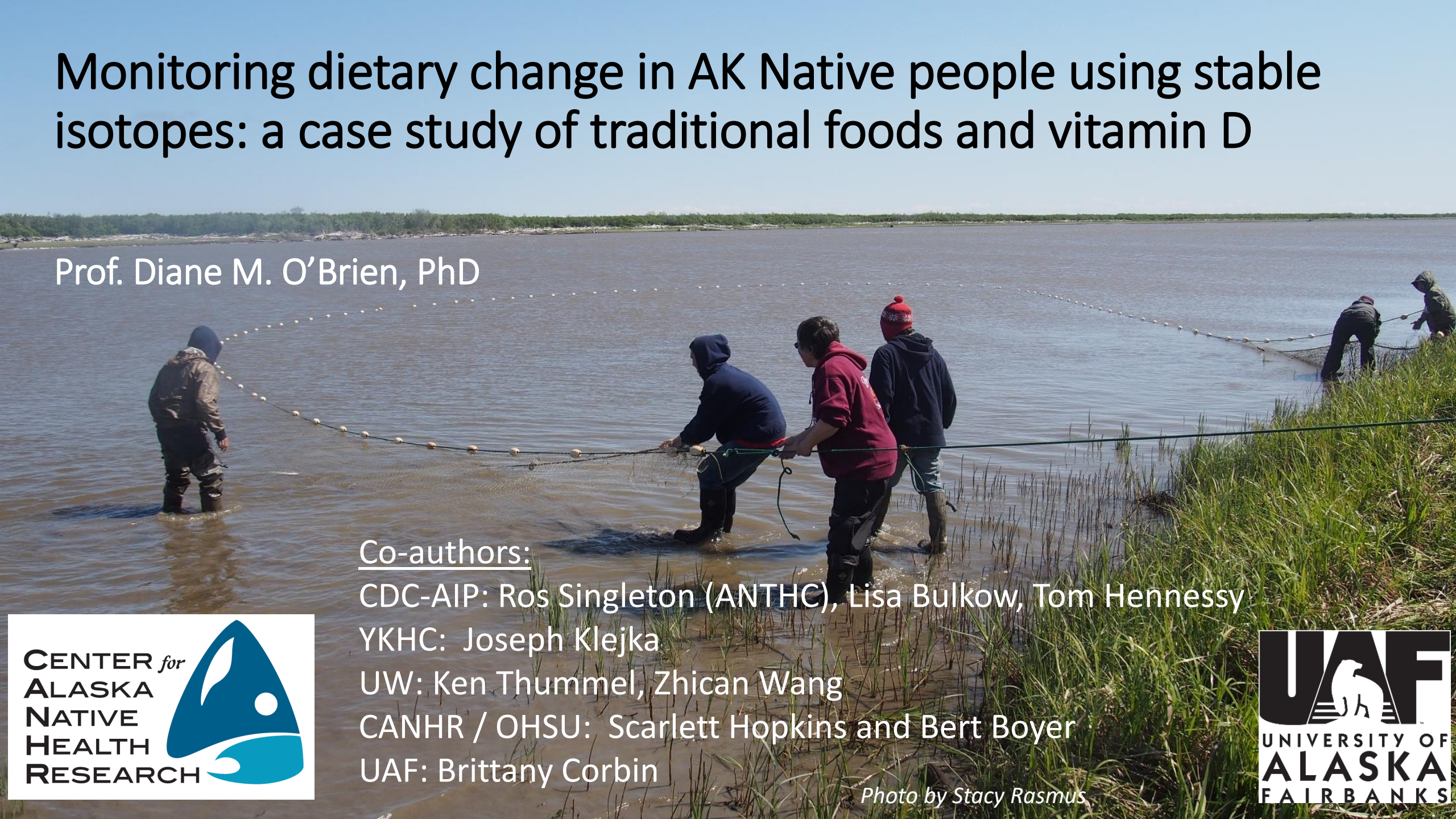
Monitoring dietary change in AK Native people using stable isotopes: a case study of traditional foods and vitamin D



Prof. Diane M. O'Brien, PhD

Co-authors:
CDC-AIP: Ros Singleton (ANTHC), Lisa Bulkow, Tom Hennessy
YKHC: Joseph Klejka
UW: Ken Thummel, Zhican Wang
CANHR / OHSU: Scarlett Hopkins and Bert Boyer
UAF: Brittany Corbin

Photo by Stacy Rasmus

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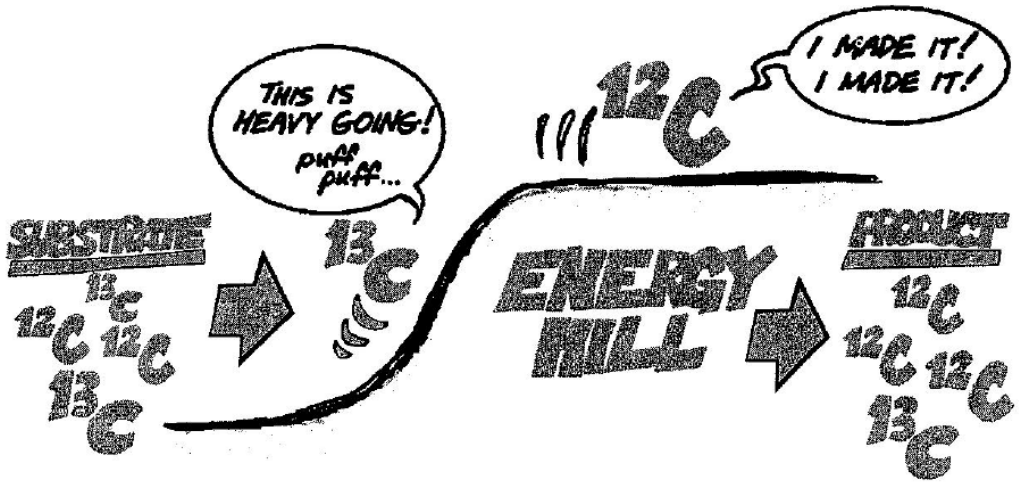
All food is the product of an ecosystem

Stable isotope ratios are ecosystem biomarkers

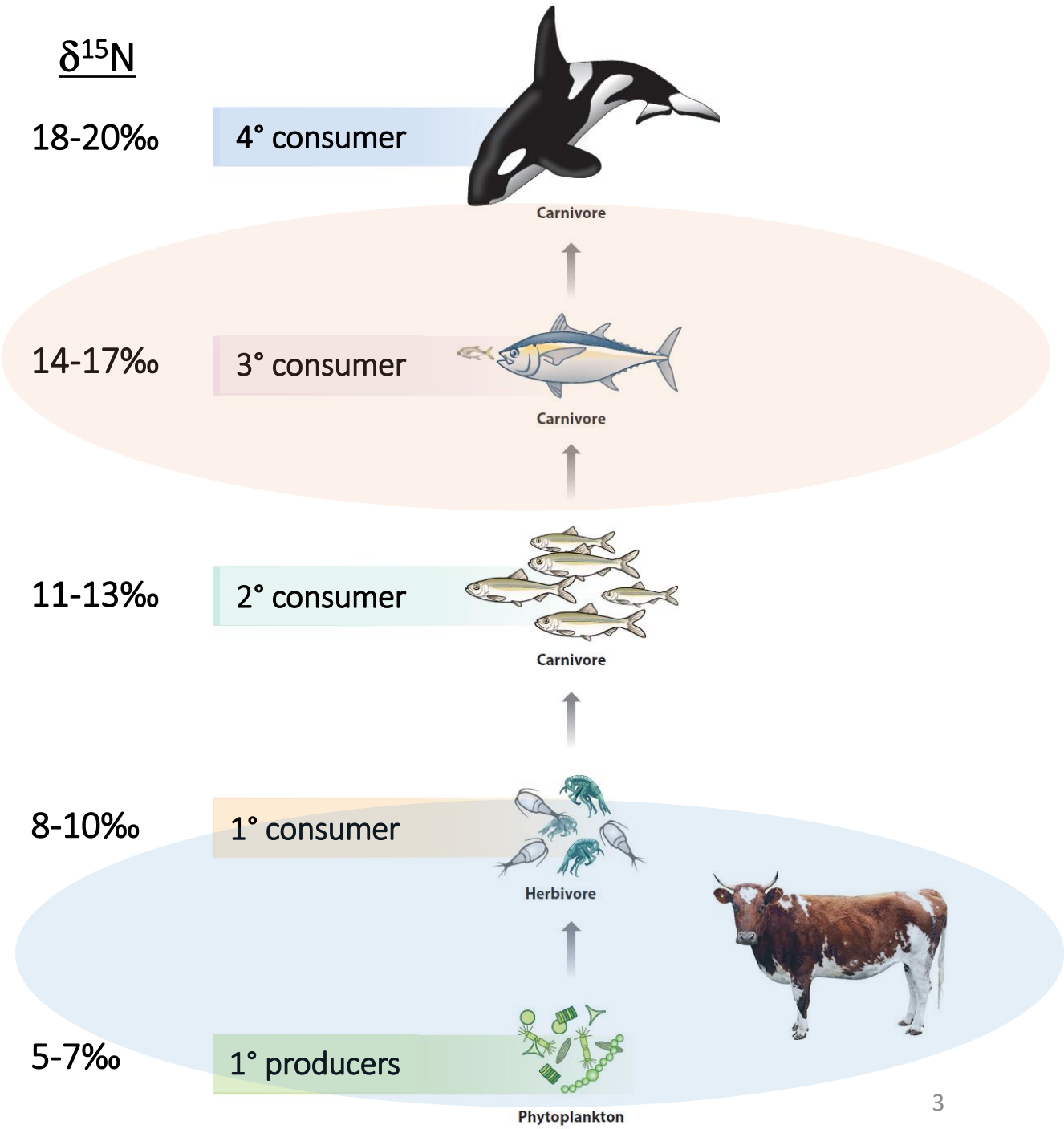
- Naturally occurring
- Naturally varying
  - can be used as tracers



Element	Stable isotopes	Abundance (%)*
Hydrogen	^{1}H (H)	99.985
	^{2}H(D)**	0.015
Carbon	^{12}C	98.892
	^{13}C	1.108
Nitrogen	^{14}N	99.635
	^{15}N	0.365
Oxygen	^{16}O	99.759
	^{17}O	0.037
	^{18}O	0.204
Sulfur	^{32}S	95.0
	^{33}S	0.75
	^{34}S	4.21
	^{35}S	0.014

Nitrogen isotope ratios (NIR) in foodwebs

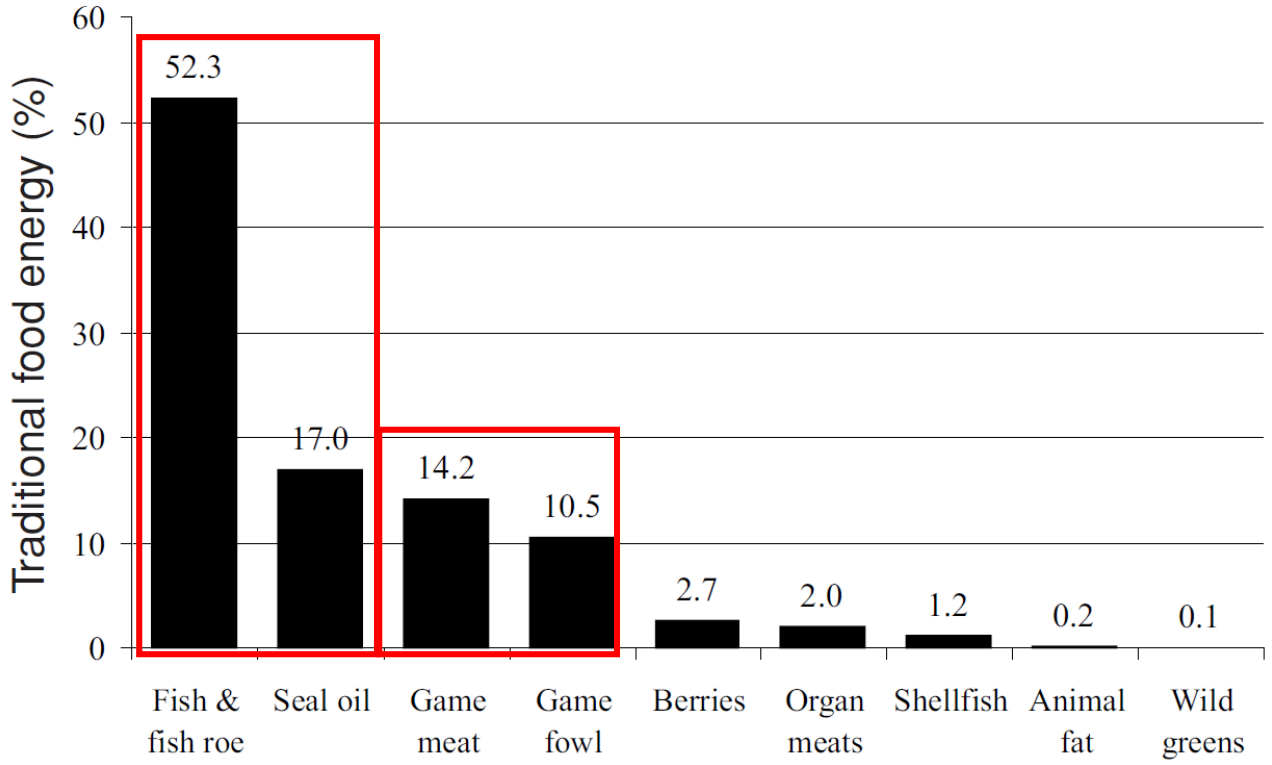
- NIR is elevated in fish and marine mammals
- Great biomarker for traditional foods in YK Delta



O'Brien 2015 ARN 35:565-594

Yup'ik Diets

- Mixed market (~78%) and traditional (~22%) diet
- Traditional diet is dominated by fish and marine mammals



Bersamin et al 2007 IJCH

NIR in blood and hair is strongly associated with traditional food intake

Photo by Stacy Rasmus

Biomarker reveals many health-related associations with Yup'ik traditional food intake

- Age
- Language
- Enculturation
- Blood lipids
- Blood pressure
- Insulin sensitivity
- Gene methylation
- Blood clotting
- Vitamin D status

- Philip et al 2017. *PLoS One* 12(11): e0183451
- O'Brien et al 2017. Public Health Nutr *20:1738-17.*
- Au et al 2017. *PLoS One PLoS One* 12(4): e173616.
- Lemas et al 2016. *Mol Nutr Food Res* 60: 2642-2653
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- Beaulieu-Jones et al. 2015. *J Nutr* 145: 931-938
- Ryman et al 2015. *Br J Nutr* 113:634-643
- O'Brien et al. 2014. *J Nutr* 144:706-713
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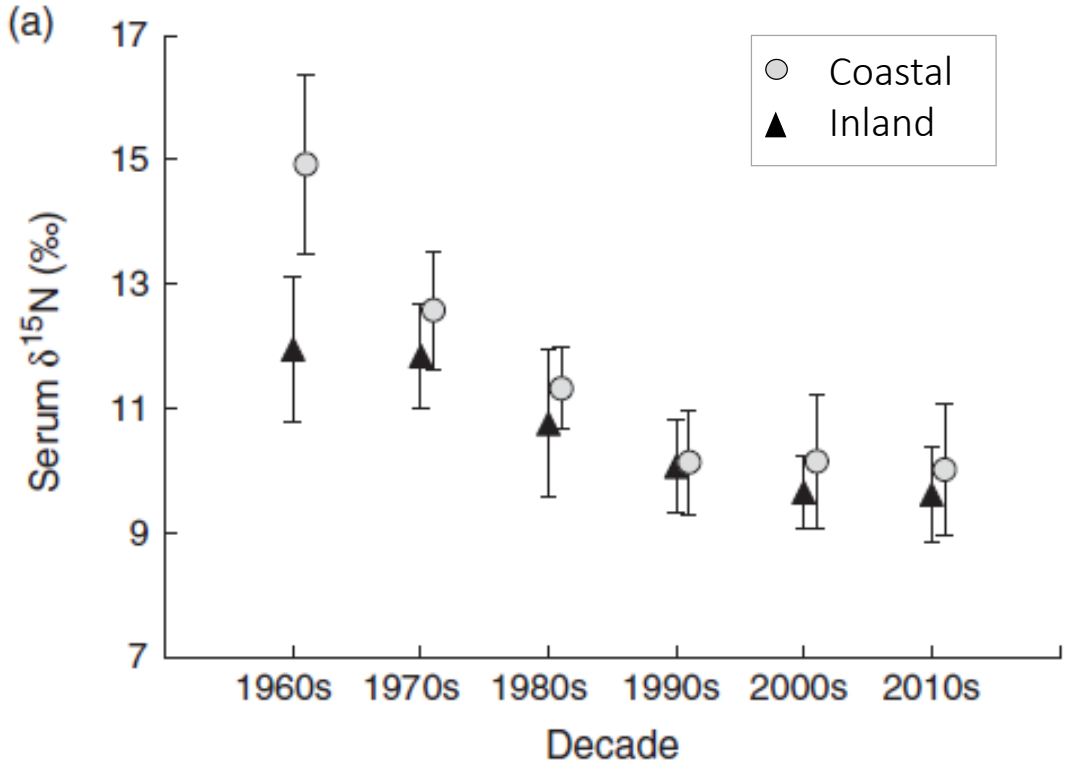
- Ryman et al 2014. *Public Health Nutr* 17:510-518
- Aslibekyan et al 2013. *Am J Hum Biol* 25:673-680
- Lemas et al 2013. *Genes and Nutr* 8:495-505
- Lemas et al 2012. *J Lipid Res* 53:175-184
- Nash et al 2012. *J Nutr* 142: 84-90.

Monitoring dietary change: the “Nutrition Transition”

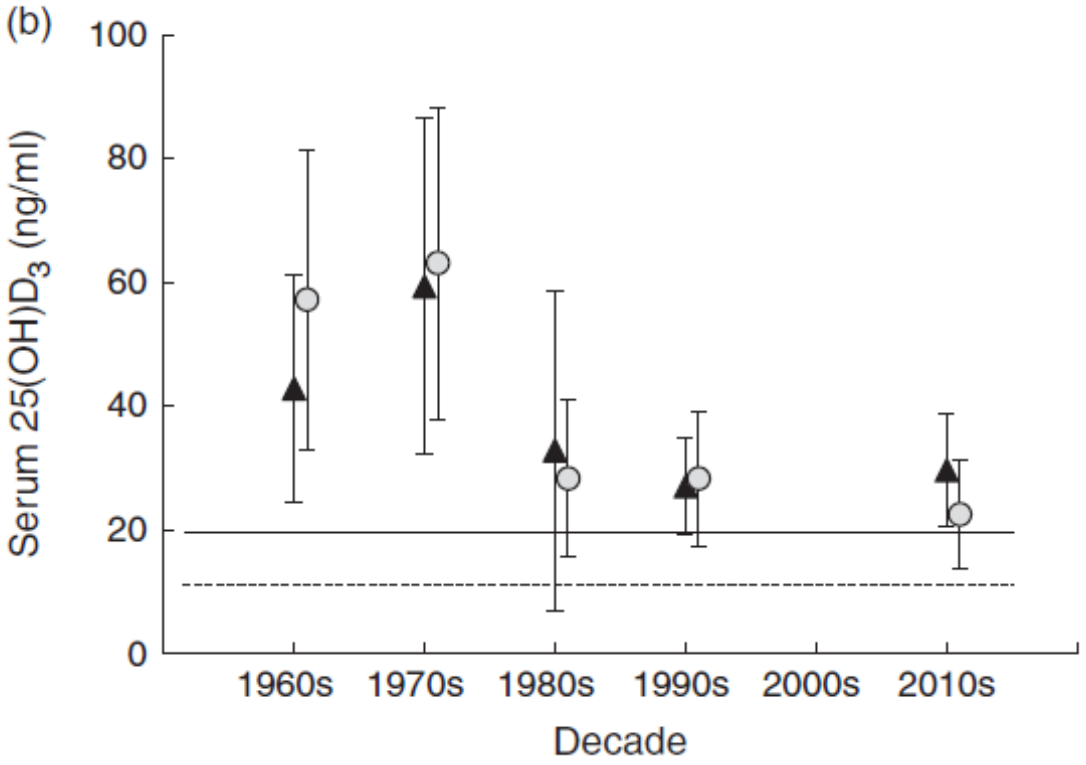
- We know it has happened – is it still happening? When were the key times of change?
- How does timing relate to increased incidence of rickets in AN infants/children? (Singleton et al 2015)
- Used the Alaska Area Specimen Bank (CDC)
  - Serum specimens dating back to early 1960’s
- 20-29 y.o. women from YK Delta
  - N = 25 per decade

Quantifying the "Nutrition Transition"

Precipitous decline in fish/marine mammal intake from the 1960s → 1990s



Associated with poorer vitamin D status in young women



O'Brien et al. 2017 PHN 20:1738-1745

State of Alaska Epidemiology

Bulletin

Department of Health and Social Services
Valerie J. Davidson, Commissioner

3601 C Street, Suite 540
Anchorage, Alaska 99503 http://dhss.alaska.gov/dph/Epi

Division of Public Health
Jay C. Butler, MD, Chief Medical Officer and Director

Local (907) 269-8000
24 Hour Emergency (800) 478-0084

Editors:
Joe McLaughlin, MD, MPH
Louisa Castrodale, DVM, MPH

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Vitamin D Deficiency in Prenatal Alaska Native Women

Current Interventions

1. YKDRH consulted with vitamin D experts and developed guidelines to supplement routinely recommended prenatal vitamins (400 IU/day)[6] with an additional 1000 IU of daily vitamin D and to monitor prenatal vitamin D levels.
2. The Alaska Native Medical Center (ANMC) changed from infant Trivisol (containing vitamins A, D, and C) to one drop of "Baby D drops" to improve adherence.

Summary

- Traditional food intake by young, YKD women dropped from the 1960's through the 1990's
- Associated with changes in vitamin D status
- Unprecedented record of dietary change spanning over 60 years
  - Ecosystem tools (stable isotopes) + biorepository
- Translated into public health policy
- We would love to apply these tools to other questions relating to dietary change

CENTER *for* ALASKA NATIVE HEALTH RESEARCH

Established in 2001 to address Alaska Native health priorities through community-engaged research

- Culturally relevant, strengths-based intervention research
  - Tribally-driven suicide and substance abuse prevention
  - Programs to strengthen traditional food systems
- Epidemiologic research
  - How genes, diet and physical activity relate to risk factors for obesity, CVD, metabolic syndrome, and vitamin D deficiency
- Methodological research
  - Resilience, well-being and strengths-based approaches to the reduction of health disparities
  - Developing tools to monitor food systems and dietary change