ALASKA: BURDEN OF CHRONIC DISEASE 2011

THE BURDEN OF CHRONIC DISEASE

Chronic diseases – such as heart disease, stroke, cancer, and diabetes – are among the most prevalent, costly, and preventable of all health problems. Leading a healthy lifestyle (avoiding tobacco use, being physically active, and eating well) greatly reduces a person's risk for developing chronic disease. Access to high-quality and affordable prevention measures (including screening and appropriate follow-up) are essential steps in saving lives, reducing disability and lowering costs for medical care.

HEART DISEASE AND STROKE

Heart disease and stroke, the second and fifth leading causes of death in Alaska, are the most common cardiovascular diseases.

- Heart disease accounted for 18% of deaths in Alaska in 2008, while stroke accounted for 5% of deaths.
- In 2009, 26% of adults in Alaska reported having high blood pressure (hypertension) and 35% of those who had their cholesterol tested reported having high blood cholesterol, which puts them at greater risk for developing heart disease and stroke.

CANCER

Cancer is the leading cause of death in Alaska.

- 25% of all deaths in Alaska in 2008 were due to cancer.
- The most commonly diagnosed cancers in Alaska are: (1) breast, (2) prostate, and (3) lung.

DIABETES

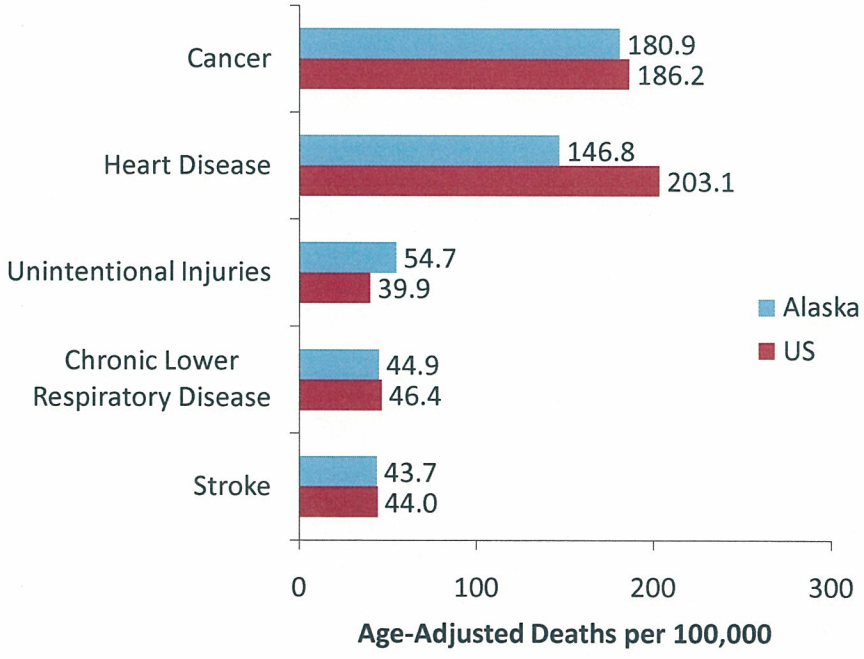
In 2008, diabetes was the 7th leading cause of death in both Alaska and the US. Likely to be underreported as a cause of death, the risk of death among people with diabetes is about twice that of people without diabetes of similar age.

- 93 Alaskans died from diabetes mellitus in 2008.
- In 2009, 6% of adults in Alaska reported being diagnosed with non-pregnancy related diabetes.

ARTHRITIS

- Arthritis is the most common cause of disability in the US, affecting more than 46 million Americans.
- In 2009, 23% of adults in Alaska reported being diagnosed with arthritis.

5 Most Common Causes of Death, Alaska Compared with United States, 2008



ALASKA: RISK FACTORS AND PREVENTIVE SERVICES

TOBACCO

Tobacco use is the single most preventable cause of death and disease in the United States. Each year, an estimated 438,000 people in the US die prematurely from smoking or exposure to secondhand smoke, and another 8.6 million have a serious illness caused by smoking. For every person who dies from smoking, 20 people suffer from at least one serious tobacco-related illness.

- In 2009, 19% of adults and 16% of high school students in Alaska reported being current smokers.

NUTRITION, PHYSICAL ACTIVITY, AND OVERWEIGHT/OBESITY

In the past 30 years, the prevalence of overweight and obesity has increased sharply for both adults and children. Physical inactivity and unhealthy eating contribute to overweight and obesity and a number of chronic diseases, including some cancers, cardiovascular disease, and diabetes.

- In 2009, 65% of adults in Alaska were overweight or obese and 26% of high school students were overweight or obese, based on self-reported height and weight.
- 83% of high school students and 77% of adults in Alaska consumed fewer than 5 servings of fruits and vegetables per day.
- 54% of Alaska high school students did not attend PE class in the past week.
- 26% of adults in Alaska did not get enough physical activity to meet federal recommendations.

EARLY DETECTION

Mammography is a screening method that has been shown to reduce mortality due to breast cancer by approximately 20-25% over 10 years among women 40 years and over.

- In 2008, 32% of women in Alaska aged 40 years or older reported not having had a mammogram within the last 2 years (which was the recommendation at the time).

Up to 60% of deaths from colorectal cancer could be prevented if persons aged 50 and older were screened regularly. Colorectal cancer can be prevented by removing precancerous polyps or abnormal growths, which can be identified during a fecal occult blood test, sigmoidoscopy, or colonoscopy.

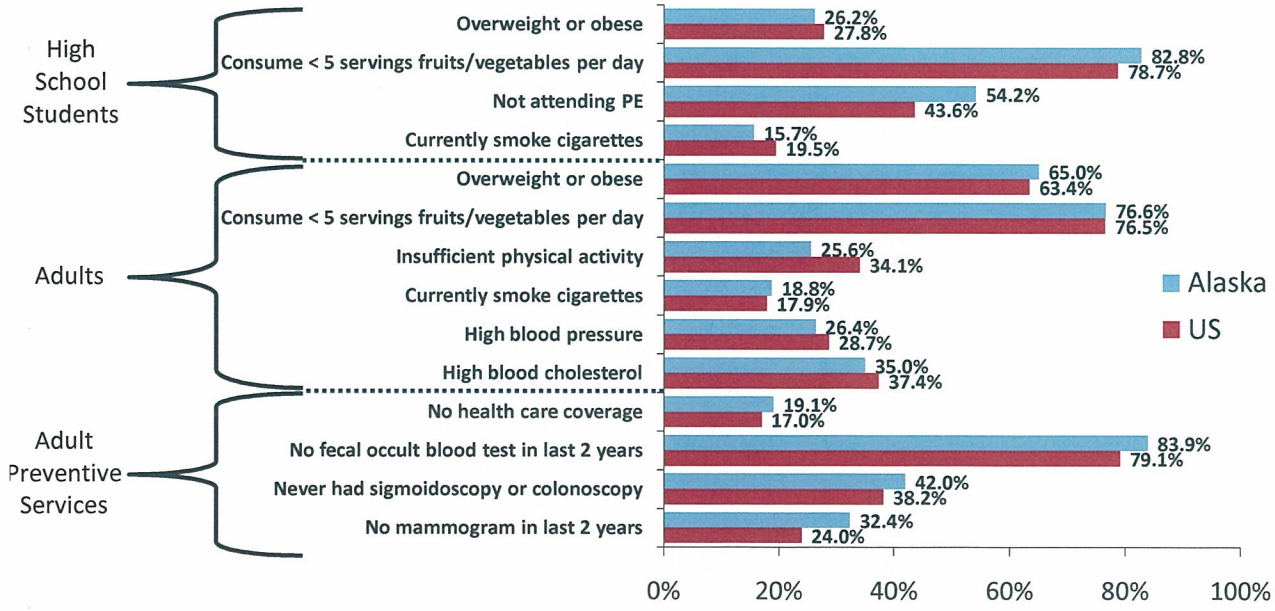
- In 2008, among Alaskans aged 50 years or older 42% reported never having had a sigmoidoscopy or colonoscopy.
- 84% reported not having had a fecal occult blood test within the past two years.

NO HEALTH CARE COVERAGE

With the US health care system changing rapidly, health care plans (e.g., health insurance, HMOs, and Medicaid/Medicare) need to ensure that all Americans have access to affordable, high-quality preventive services.

- In 2009, 19% of adults aged 18-64 in Alaska reported having no health care coverage.

Preventive Services and Risk Factors, Alaska Compared with United States



4/2005 thru 3/2007
Ketchikan

Research and Professional Briefs

Vitamin D Deficiency in a Nonrandom Sample of Southeast Alaska Natives

JOSEPH T. FROST, MPH, RD; LANI HILL, FNP

ABSTRACT

Serum vitamin D has recently been inversely associated with risk for type 2 diabetes. Recent literature suggests that many more individuals than generally thought suffer from vitamin D deficiency. Southeast Alaskan Natives are at an increased risk due to limited sunlight exposure and possible inadequate vitamin D intake. Therefore, the relationship between vitamin D and glucose should be investigated specifically in the southeast Alaska Native population. A review of lab records yielded 83 charts of patients found to have a serum 25-hydroxyvitamin D during a 2-year period. Upon review of these charts, only nine of 83 vitamin D levels were found to exceed the 32 ng/mL (80 nmol/L) threshold. Age and vitamin D levels were associated in a positive linear relationship ($r=0.354$, $P=0.028$). The patients in the lowest vitamin D quartile were younger in age compared to the highest quartile (14.6 years, 95% confidence interval: 4.9, 24.29; $P=0.004$). The high rate of deficiency noted in this sample suggests this population should be further assessed for vitamin D deficiency. Future studies are needed to confirm the association between a vitamin D deficiency and diabetes incidence in this population.
J Am Diet Assoc. 2008;108:1508-1511.

Although traditionally associated with calcium absorption and bone health, expanded roles for vitamin D, including a relationship to diabetes, have recently been reported in the literature. Low serum 25-hydroxyvitamin D levels have been found in individuals with diabetes compared to controls (1,2). The Third Nutrition and Health Examination Survey revealed an inverse association between risk of diabetes and 25-hydroxyvitamin D levels (3). A similar association was seen in the Nurses' Health Study (4). Serum 25-hydroxyvitamin D levels were found to be inversely associated with pancreatic beta cell function, thus suggesting a cause and effect relationship with diabetes (5). Recent research suggests that many more individuals than generally thought, especially those in northern latitudes or with other sunlight restrictions, are deficient in vitamin D (6-9). Both the recommended levels of serum vitamin D and the Adequate Intake from food sources have recently been suggested to be inadequate. At these levels it is thought the beneficial effect of vitamin D cannot be achieved. (6,8,10-12). Despite being at an increased risk for vitamin D deficiency due to limited sunlight exposure (13,14) and lactose intolerance (up to 80%) (15), southeast Alaskan Natives have not been included in vitamin D deficiency studies. The objectives of this study were to investigate vitamin D deficiency in the southeast Alaskan Native population and its possible role in the incidence of diabetes.

METHODS

A manual review of lab records for the 2-year time period of April 1, 2005, to March 30, 2007, was used to identify patients who had 25-hydroxyvitamin D tests completed as part of their care received at the Ketchikan Indian Community Tribal Health Clinic, a native health clinic on an Alaskan island that receives an annual rainfall of 12.5 feet per year. (Natives with varying degrees of native ancestry and who belong to one of 557 federally recognized tribes qualify for health care through Indian Health Service policies. In general, the term *American Indian* or *Alaskan Native* refers to those with native, although not necessarily exclusive, ancestry. Therefore, degree of Native blood varies in this population.)

This review yielded a nonrandom sample of 83 charts of Alaskan Natives. We conducted a retrospective electronic and manual review of these charts to investigate the possible relationship between serum vitamin D levels and abnormal glucose levels.

Electronic and paper charts of individuals known to have the test performed were reviewed, and test results for serum vitamin D and glucose, sex, age, and body mass index (BMI) were recorded. In the event of multiple vitamin D tests, only the initial test was used in data analysis. In all cases, the fasting glucose measured closest to the date of the initial vitamin D test was recorded. Glucose values obtained more than 1 year apart from the vitamin D test were excluded from the analysis. Of the 83 patients, fasting blood glucoses were recorded for 51.

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Manuscript accepted: February 29, 2008.

0002-8223/08/10809-0011$34.00/0
doi: 10.1016/j.jada.2008.06.427

Table. Demographic data, 25-hydroxyvitamin D levels, and fasting glucose levels of patients with and without diabetes (n=83 except where otherwise noted)

	Patients with diabetes (n)	Patients without diabetes (n)	*P* value
Sex			
Male	12	16	
Female	16	39	
	← *mean±SD*[a] →		
Age[b] (y)	56±14	45±16	0.004
BMI[bc]	38.9±9.2	31.9±7.2	0.001
25-hydroxyvitamin D (ng/mL)	15.7±8.6	17.8±12.1	0.348
Fasting glucose[ab] (mg/dL)	139.8±49.9 (n=16)	96.2±11.1 (n=35)	<0.001

[a]SD=standard deviation.
[b]Denotes category of statistical significance at the α=.05 level.
[c]BMI=body mass index; calculated as kg/m^2.

Data from 2-hour oral glucose tolerance tests are not reported because only five were recorded. Random glucose levels were not analyzed due to multiple variables affecting their results. Vitamin D samples were drawn in-house and sent to a commercial laboratory for analysis using immunochemiluminometric assay. The threshold for the laboratory's vitamin D assay is 7.0 ng/mL (17.5 nmol/L); for data analysis all "undetectable" values were assigned 7.0 ng/mL (17.5 nmol/L).

Minitab version 15 (2007, Minitab Inc, State College, PA) was used for statistical analysis. Univariate regression calculations were done. Subjects were divided into quartiles based on vitamin D levels and comparisons were made using two-sample *t* tests with regard to glucose values, sex, age, and BMI. Results were considered significant at the α=.05 level.

The protocol for this study was granted expedited status under 45 CFR 46.110 by the Alaska Area Institutional Review Board in Anchorage. It was also approved by Ketchikan Indian Community Tribal Health Clinic Administration staff, the Ketchikan Indian Community Health Board, and the Ketchikan Indian Community Tribal Council.

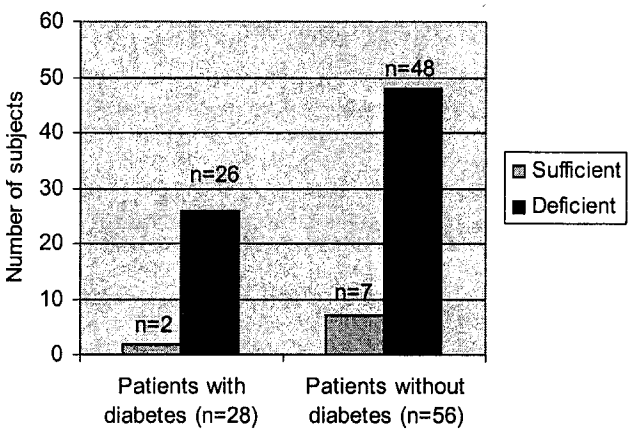


Figure. Vitamin D sufficiency of patients with and without diabetes using 32 ng/mL (80 nmol/L) as the minimum value for sufficiency.

RESULTS AND DISCUSSION

Of the 83 Native patients found to have received a 25-hydroxyvitamin D test during the 2-year period, 55 were female and 28 were male, with a mean age of 49 years (range=19 to 94 years) (Table). Twenty-eight of these patients were diagnosed with diabetes, of which all but two were vitamin D–deficient. Of the 55 without diabetes, only seven were vitamin D–sufficient (Figure). Subjects without diabetes were younger (−10.39, 95% confidence interval [CI]: −17.31, −3.47; P=0.004), had a lower BMI (−7.05, 95% CI: −11.06, −3.05; P=0.001), and had lower fasting blood glucose values (−43.63, 95% CI: −61.29, −25.97; P=<0.001). The mean (±standard deviation) 25-hydroxyvitamin D level was 17.1±11.0 ng/mL (42.8±27.5 nmol/L). Using two-sample *t* tests, no significant differences were found between sexes. Results indicated a significant positive linear relationship of age with respect to vitamin D levels (r=0.354, P=0.028).

Subjects were divided into quartiles based on 25-hydroxyvitamin D levels. These quartiles were compared in terms of sex, age, BMI, and fasting blood glucose values. With the exception of age, no statistically significant differences were observed between quartiles. The lowest quartile was on average 14.6 years younger compared with the highest quartile (95% CI: −24.29, −4.91; P=0.004). Patients known to have diabetes were then removed from the analysis (to control for confounding from the diabetes disease process or treatment, which may affect vitamin D), yielding similar results.

No statistically significant relationships between vitamin D levels and blood glucose levels were observed. However, only nine of 83 vitamin D values were more than the recommended threshold of 32 ng/mL (80 nmol/L), and 18 of the vitamin D levels were so low that their actual value was undetectable. Although we cannot extrapolate these results to say that 89% of the population is vitamin D–deficient, the data suggest a basis for further investigation. It would seem unlikely to observe such a high rate of deficiency in this study, if there were not a high prevalence of vitamin D deficiency, even with perceptive clinicians ordering vitamin D tests for patients they thought to be at high risk for deficiency. The intent

of the study to compare serum glucose values between individuals of high and low serum vitamin D levels was somewhat undermined by the fact that so few normal values were observed. In fact, even the highest quartile of vitamin D values included values much less than the threshold of vitamin D deficiency.

The high prevalence of vitamin D deficiency found in this study is supported by studies reporting vitamin D deficiency in populations at higher latitudes or with otherwise limited sunlight exposure (although not at the magnitude found in this convenience sample) (7,8,12,13). The positive linear correlation between age and vitamin D levels found in this study differs from the common belief that vitamin D levels decrease with age. However, this positive correlation has been reported previously (7).

The finding related to subjects with known diabetes is also intriguing; only two of the 28 patients had 25-hydroxyvitamin D levels more than the 32 ng/mL (80 nmol/L) threshold. This is consistent with previous reports of vitamin D deficiency in patients with diabetes (1,2). Again, this is not a random sample but it does represent 20% of the known patients with diabetes per the Ketchikan Indian Community Diabetes Management System database. From a chart review we cannot determine that low vitamin D levels were a risk factor for diabetes in these individuals; however, this possibility deserves further investigation.

There are clear limitations to the design of this study. First, the study is retrospective in nature and therefore cannot determine causality. Second, this study did not assess known contributors to serum 25-hydroxyvitamin D levels, such as diet, supplementation, sunlight exposure, and medications that may interfere with vitamin D absorption and/or utilization. The results include 59 vitamin D levels measured during autumn and winter months, when vitamin D levels are thought to be lowest. Furthermore, the study consisted of a convenience sample of patients who were likely tested by providers on their suspicion that the patients had low vitamin D status. The study was not powered to detect differences; however, these data support the need for a larger study to investigate this association.

Despite these limitations, this study design offered a cost-effective opportunity to explore the possibility of vitamin D deficiency in this population and its relationship with diabetes. Given southeast Alaskan Natives' high risk for vitamin D deficiency, the increasing incidence of diabetes (100% to 125% in 14 years) (16), and recent research associating diabetes and vitamin D status, these results should not be dismissed. Although it is tempting to disregard vitamin D deficiency in this population as a genetic difference in normal values, it must be noted that African Americans also have lower vitamin D levels and have a 33% higher risk for cancer (17). Nor should Chiu and colleagues' conclusion that increasing a person's blood concentration of 25-hydroxyvitamin D from 10 ng/mL (25 nmol/L) to approximately 30 ng/mL (75 nmol/L) would improve insulin sensitivity by 60% be easily dismissed as not applicable to the native population (5).

Future efforts to explain the increase in incidence of diabetes should consider decreasing vitamin D–rich fish and fish oil consumption in the native population and the potential resultant decrease in serum vitamin D levels. It has been reported that in at least one group of Alaskan Natives that the consumption of traditional foods is much less common in younger natives compared with elders: 50% less in some categories of native food (18). Decreased traditional food consumption combined with additional lifestyle changes (eg, increased automobile use, more indoor activities, sedentary lifestyle) may be promote vitamin D deficiency.

CONCLUSIONS

This study suggests southeast Alaskan Natives may be at risk for vitamin D deficiency. To the extent that vitamin D plays a role in the etiology of diabetes and other chronic disorders, Alaskan Natives with vitamin D deficiency may be at increased risk for these diseases. This study's finding of decreased vitamin D levels in younger individuals is of concern from a public health standpoint and should be further evaluated. Specifically, the possibility that elder natives consume more fish and fish oils and therefore have higher vitamin D levels should be considered. Registered dietitians should be aware of the emerging expanded role of vitamin D in chronic diseases such as diabetes, and should consider vitamin D status in their nutrition assessments, especially for patients with limited sun exposure.

The corresponding author is a commissioned officer in the United States Public Health Service but is submitting this manuscript as an individual and not on behalf of the Federal Government.

The authors thank Carolyn E. Ford, PhD, for her contribution to the conceptual design of the protocol, and the Ketchikan Indian Community/Official Village of Saxman Health Board and the Ketchikan Indian Community Tribal Council for their permission to conduct this research.

References

1. Scragg R, Holdaway I, Singh V, Metcalf P, Baker J, Dryson E. Serum 25-hydroxyvitamin D3 levels decreased in impaired glucose tolerance and diabetes mellitus. *Diabetes Res Clin Pract*. 1995;27:181-188.
2. Isaia G, Giorgino R, Adami S. High prevalence of hypovitaminosis D in female type 2 diabetic population. *Diabetes Care*. 2001;24:1496.
3. Scragg R, Sowers M, Bell C. Serum 25-hydroxyvitamin D, diabetes, and ethnicity in the Third National Health and Nutrition Examination Survey. *Diabetes Care*. 2004;27:2813-2818.
4. Pittas AG, Willett WC, Dawson-Hughes B, Manson JE, Li T, Hu FB. Vitamin D and calcium intake in relation to type 2 diabetes in women. *Diabetes Care*. 2006;29:650-656.
5. Chiu KC, Chu A, Go VW, Saad MF. Hypovitaminosis D is associated with insulin resistance and β cell dysfunction. *Am J Clin Nutr*. 2004; 79:820-825.
6. Thomas MK, Lloyd-Jones DM, Thadhani RI, Shaw AC, Deraska DJ, Kitch BT, Vamvakas EC, Dick IM, Prince RL, Finkelstein JS. Hypovitaminosis D in medical inpatients. *N Engl J Med*. 1998;338:777-783.
7. Tangpricha V, Pearce EN, Chen TC, Holick MF. Vitamin D Insufficiency among free living healthy young adults. *Am J Med*. 2002;112: 659-662.
8. Sullivan SS, Rosen CJ, Halteman WA, Chen TC, Holick MF. Adolescent girls in Maine are at risk for vitamin D insufficiency. *J Am Diet Assoc*. 2005;105:971-974.
9. Ziambaras K, Dagogo-Jack S. Reversible muscle weakness in patients with vitamin D deficiency. *West J Med*. 1997;167:435-439.
10. Raloff J. Vitamin D: What's enough? ScienceNews Web site. www.sciencenews.org/articles/20041016/bob9.asp. Accessed January 15, 2007.
11. Hollis BW. Circulating 25-Hydroxyvitamin D levels indicative of vitamin D sufficiency: Implications for establishing a new effective dietary intake recommendation for vitamin D. *J Nutr*. 2005;317-322.

12. Glerup H, Mikkelsen K, Poulesen L, Hass E, Overbeck S, Thomsen J, Charles P, Eriksen EF. Commonly recommended daily intake of vitamin D is not sufficient if sunlight exposure is limited. *J Intern Med*. 2000;247:260-268.
13. Holick MF, Jenkins M. *The UV Advantage: The Medical Breakthrough that Shows How to Harness the Power of the Sun for Your Health*, 1st ed. New York, NY: ibooks; 2003.
14. City profile for Ketchikan, Alaska. City-Data.com Web site. http://www.city-data.com/city/Ketchikan-Alaska.html. Accessed January 15, 2007.
15. Duncan IW, Scott EM. Lactose intolerance in Alaskan Indians and Eskimos. *Am J Clin Nutr*. 1979;25:867-868.
16. Schraer C, Ramesh M. Special Diabetes Programs for Indians Grant: Outcomes in Alaska. Anchorage, AK: Alaska Annual Diabetes Conference; December 2006.
17. Garland CF, Garland DC, Gorham ED, Lipkin M, Newmark H, Mohr SB, Holick MF. The role of vitamin D in cancer prevention. *Am J Public Health*. 2006;96:252-261.
18. Nobmann ED, Ponce R, Mattil C, Devereux R, Dyke B, Ebbesson SE, Laston S, MacCluer J, Robbins D, Romenesko T, Ruotolo G, Wenger CR, Howard BV. Dietary intakes vary with age among Eskimo adults of northwest Alaska in the GOCADAN Study, 2000-2003. *J Nutr*. 2005;135:856-862.

SEASONAL VARIATION IN SERUM 25-HYDROXYVITAMIN D IN HEALTHY FAIRBANKS, ALASKA RESIDENTS: RELATION TO DIET AND SUNLIGHT EXPOSURE

A

THESIS

Presented to the Faculty of the University of Alaska

in Partial Fulfillment of the Requirements

for the Degree of

MASTER OF SCIENCE

By

Meredith Grant Tallas, B.S.

Fairbanks, Alaska

December 1986

ABSTRACT

This study tested the hypothesis that lower UV radiation during the Fairbanks winter may cause seasonal vitamin D deficiencies. Forty-seven adult Caucasians (mean age, 34 years) donated monthly blood samples and gave 4-day food and sunlight exposure records during one year. There was a highly significant seasonal variation in serum 25-(OH)vitamin D (25-OHD), with the lowest mean mid-winter value above deficiency levels, and a yearly mean of 27 ng/ml for the full group. Analyses of variance indicated significant effects of vitamin D intake, sunlight exposure and sex on serum 25-OHD. Vitamin D intake appeared to be a more important factor determining year-round 25-OHD levels than sunlight exposure. Males had yearly mean 25-OHD levels 16% higher than females and 25% of the females, but none of the males, had yearly means less than 20 ng/ml indicating that females were at greater risk for the development of vitamin D deficiency.

Record: 1

Title: Vitamin D and calcium supplementation reduces cancer risk: results of a randomized trial.

Authors: Lappe JM; Travers-Gustafson D; Davies KM; Recker RR; Heaney RP

Author Address: Osteoporosis Research Center, Creighton University, Omaha, NE 68131, USA. jmlappe@creighton.edu

Source: The American Journal Of Clinical Nutrition [Am J Clin Nutr] 2007 Jun; Vol. 85 (6), pp. 1586-91.

Publication Type: Journal Article; Randomized Controlled Trial; Research Support, N.I.H., Extramural

Language: English

Journal Information: *Country of Publication:* United States *NLM ID:* 0376027 *Publication Model:* Print *Cited Medium:* Print *ISSN:* 0002-9165 (Print) *Linking ISSN:* 00029165 *NLM ISO Abbreviation:* Am. J. Clin. Nutr. *Subsets:* Core Clinical (AIM); MEDLINE

MeSH Terms: Dietary Supplements*
Calcium/*therapeutic use
Neoplasms/*prevention & control
Vitamin D/*therapeutic use
Calcifediol/blood; Double-Blind Method; Female; Fractures, Bone/prevention & control; Humans; Incidence; Kaplan-Meier Estimate; Logistic Models; Middle Aged; Neoplasms/epidemiology

Abstract: **Background:** Numerous observational studies have found supplemental calcium and vitamin D to be associated with reduced risk of common cancers. However, interventional studies to test this effect are lacking.
Objective: The purpose of this analysis was to determine the efficacy of calcium alone and calcium plus vitamin D in reducing incident cancer risk of all types.
Design: This was a 4-y, population-based, double-blind, randomized placebo-controlled trial. The primary outcome was fracture incidence, and the principal secondary outcome was cancer incidence. The subjects were 1179 community-dwelling women randomly selected from the population of healthy postmenopausal women aged >55 y in a 9-county rural area of Nebraska centered at latitude 41.4 degrees N. Subjects were randomly assigned to receive 1400-1500 mg supplemental calcium/d alone (Ca-only), supplemental calcium plus 1100 IU vitamin D3/d (Ca + D), or placebo.
Results: When analyzed by intention to treat, cancer incidence was lower

in the Ca + D women than in the placebo control subjects (P < 0.03). With the use of logistic regression, the unadjusted relative risks (RR) of incident cancer in the Ca + D and Ca-only groups were 0.402 (P = 0.01) and 0.532 (P = 0.06), respectively. When analysis was confined to cancers diagnosed after the first 12 mo, RR for the Ca + D group fell to 0.232 (CI: 0.09, 0.60; P < 0.005) but did not change significantly for the Ca-only group. In multiple logistic regression models, both treatment and serum 25-hydroxyvitamin D concentrations were significant, independent predictors of cancer risk. **Conclusions:** Improving calcium and vitamin D nutritional status substantially reduces all-cancer risk in postmenopausal women. This trial was registered at clinicaltrials.gov as NCT00352170.

Comments: Comment in: Am J Clin Nutr. 2007 Dec;86(6):1804-5; author reply 1805-6. (PMID: 18065602)
Comment in: Am J Clin Nutr. 2007 Nov;86(5):1549; author reply 1549-50. (PMID: 17991672)
Comment in: Am J Clin Nutr. 2008 Mar;87(3):792-3; author reply 793-4. (PMID: 18326620)
Comment in: Am J Clin Nutr. 2008 Mar;87(3):792; author reply 793-4. (PMID: 18326621)
Erratum in: Am J Clin Nutr. 2008 Mar;87(3):794.

Grant Information: AG14683-01A2 United States AG NIA NIH HHS

Molecular Sequence: ClinicalTrials.gov NCT00352170

Substance Nomenclature: 1406-16-2 (Vitamin D)
19356-17-3 (Calcifediol)
7440-70-2 (Calcium)

Entry Dates: *Date Created:* 20070608 *Date Completed:* 20070711 *Latest Revision:* 20101118

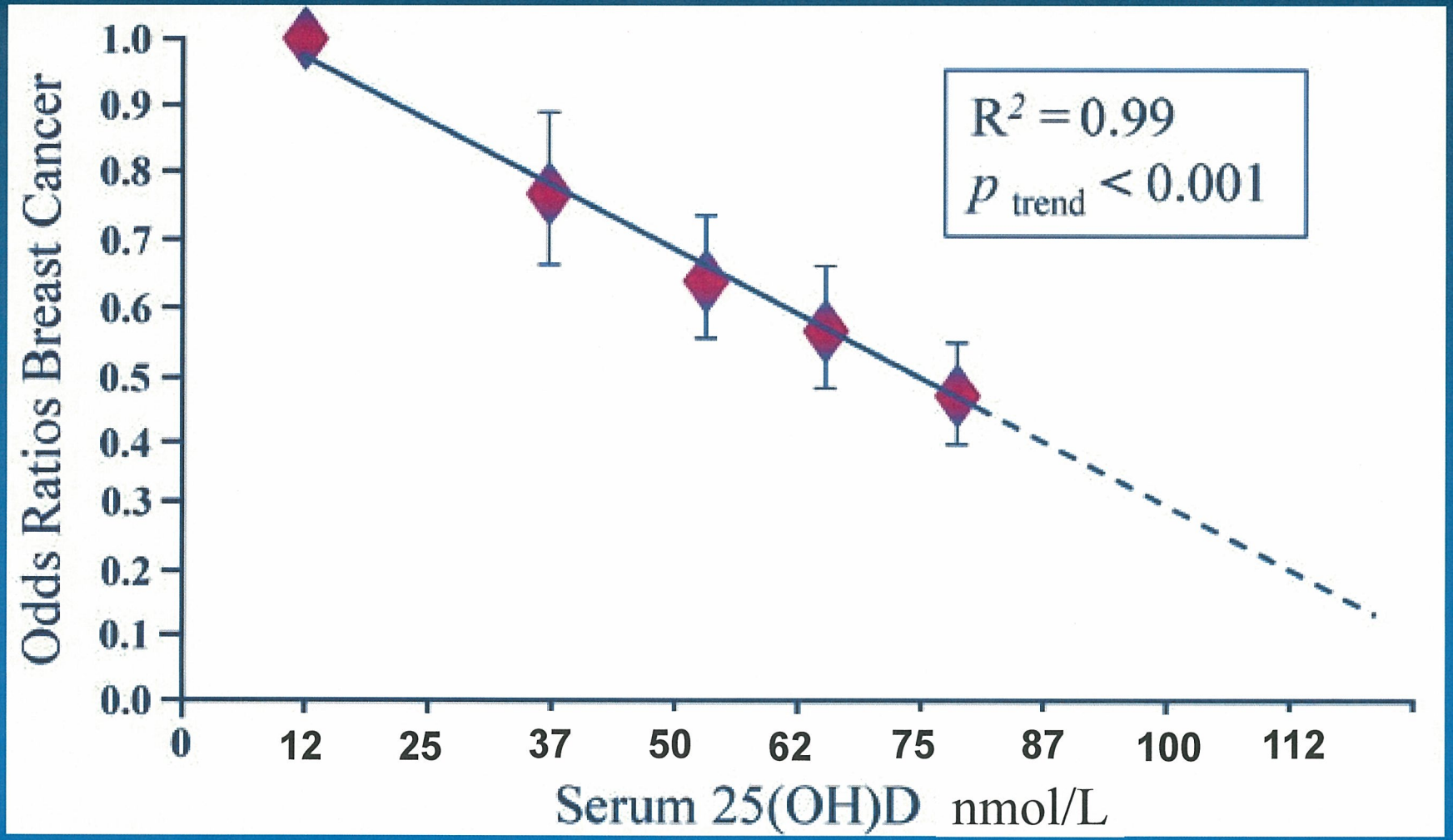
Update Code: 20101124

PMID: 17556697

Database: MEDLINE

Breast Cancer Dose Response Risk Reduction

Garland, et al. Meta-Analysis of Dose Response, 2008



1. Lowe LC, et al. Plasma 25-hydroxy vitamin D ... Eur J Cancer. 2005;41:1164-9.
2. Bertone-Johnson, E.R. et al. Cancer Epidemiol Biomarkers Prev. 2005; 14: 1991-7.
3. Abbas S, et al. Serum 25-hydroxyvitamin D and risk of breast...Carcinogenesis. 2008;29:93-9.
4. Woolfe B. [Methods for combining 2x2 tables.] Ann Hum Genet 1955;19:251-5.