Is Vitamin "D" a Breakthrough for Addressing Health Disparities?

Presented by:

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Mattapan Community Health Center

- Is a federally qualified Health Center with a commitment to provide quality comprehensive, accessible, and affordable community health care that is culturally sensitive to the needs of our patients.
- Has proudly provided health services in the community since 1972.
- Provider of Choice for ~7,000 patients annually through 26,000 visits.
- Accepts all forms of health insurance and has a sliding fee scale for uninsured and underserved individuals

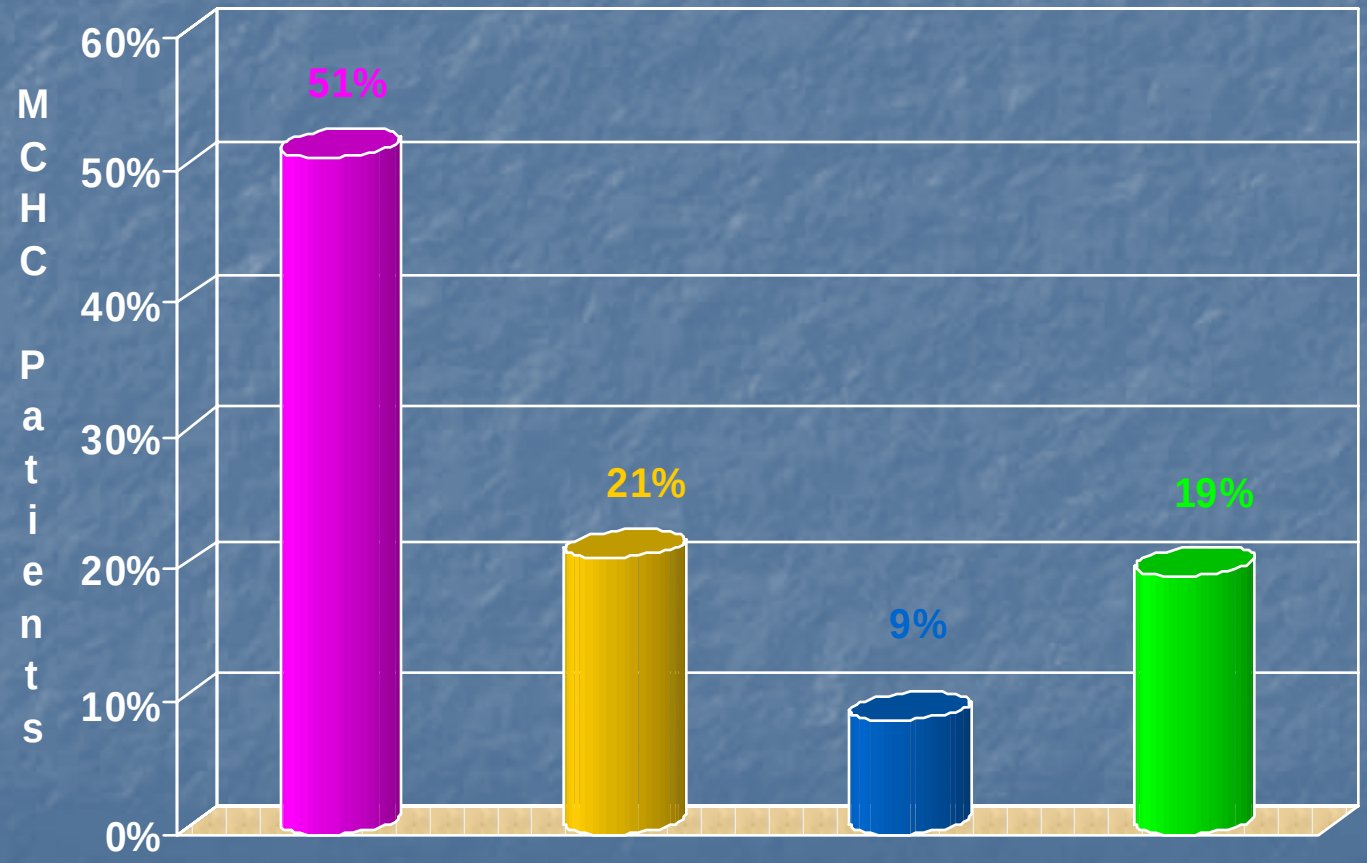
Building a Healthier Community

Mattapan Community Health Center Patients' Profile, 2006

- **92% African Americans**
- **60% Females**
- **71% are birth to 44 Age Group**

Source: MCHC InfoPoint Reports

Mattapan Community Health Center
Patient Income CY, 2006



Mattapan Community Health Center
Top 10 Diagnoses, 2007

1. **Vitamin D Deficiency**
2. **Hypertension**
3. **Diabetes Mellitus Type 2**
4. **Hypercholesterolemia** (High Cholesterol)
5. **Asthma**
6. **Sexually Transmitted Diseases** (Chlamydia and Gonorrhea)
7. **Upper Respiratory Infection**
8. **Rhinitis, Allergic** (Hay Fever)
9. **Obesity**
10. **Anemia, Iron Deficiency**

NOTE: Most frequent diagnoses by Mattapan Community Health Center's Providers in the past year.

Mattapan Community Health Center Health Priorities

- Increase access to health care
- Decrease health disparities
  - Overweight in Children
  - Diabetes
  - Cancers
- Community-Based Participatory Research (CBPR)
  - Vitamin D
  - Asthma, etc.

What is a "health disparity?"

The first official definition for "health disparities" was developed in September 1999, in response to a White House initiative. The National Institutes of Health (NIH) convened an NIH-wide working group, charged with developing a strategic plan for reducing health disparities. That group developed the first NIH definition of "health disparities:"

"Health disparities are differences in the incidence, prevalence, mortality, and burden of diseases and other adverse health conditions that exist among specific population groups in the United States."

What is a "health disparity?"

Current information about the biologic and genetic characteristics of minority populations does not explain the health disparities experienced by these groups compared with the white, non-Hispanic population in the United States. These disparities are believed to be the result of the complex interaction among genetic variations, environmental factors, and specific health behaviors.

- *From the Home Page of the CDC OMHD Website*, http://www.cdc.gov/omhd/AMH/AMH.htm

U.S. Health Disparities

Figure 1 from the CDC National Vital Statistics Reports, Volume 54, Number 14 – United States Life Tables, 2003

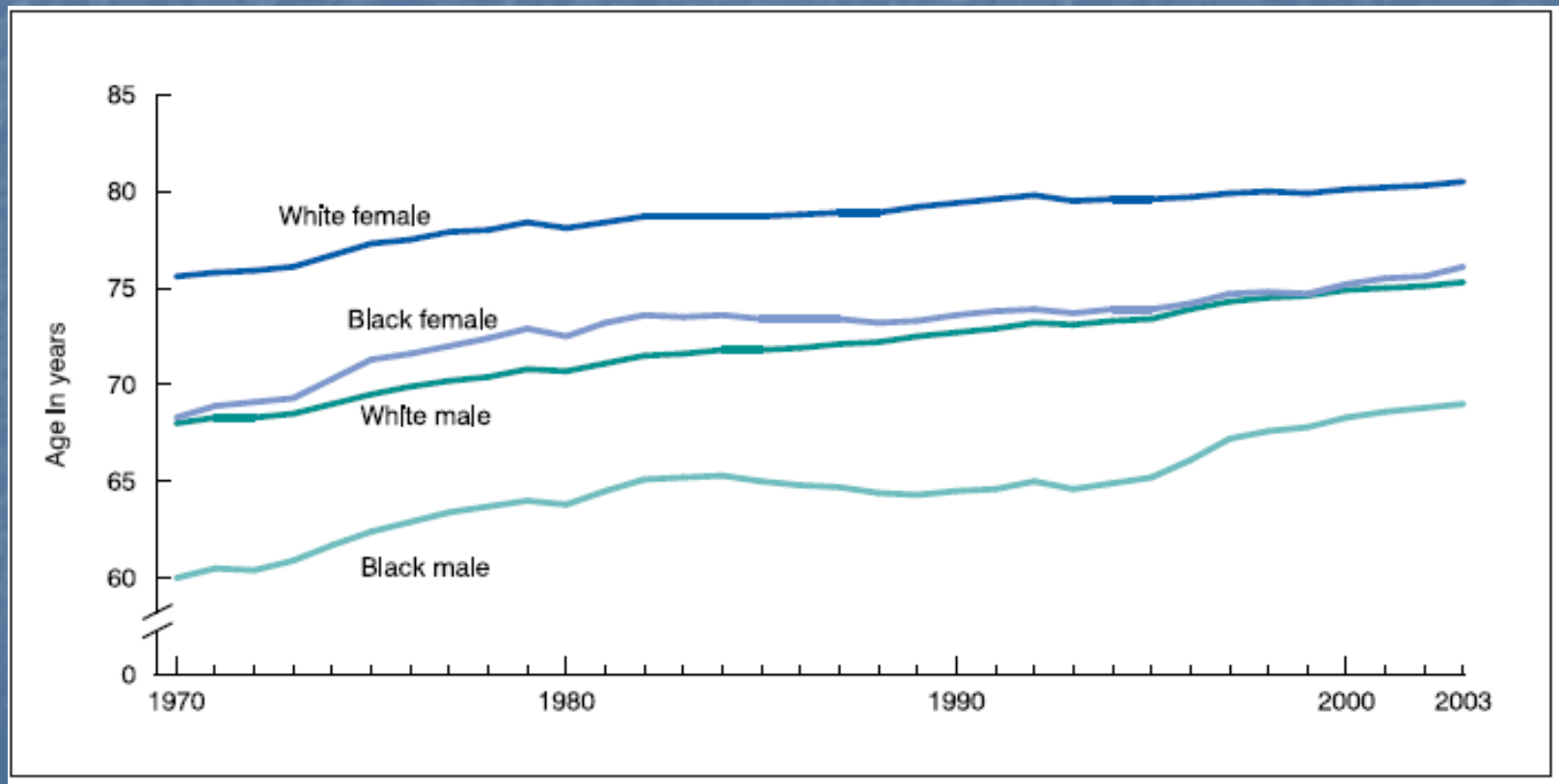


Figure 1. Life expectancy at birth by race and sex: 1970–2003

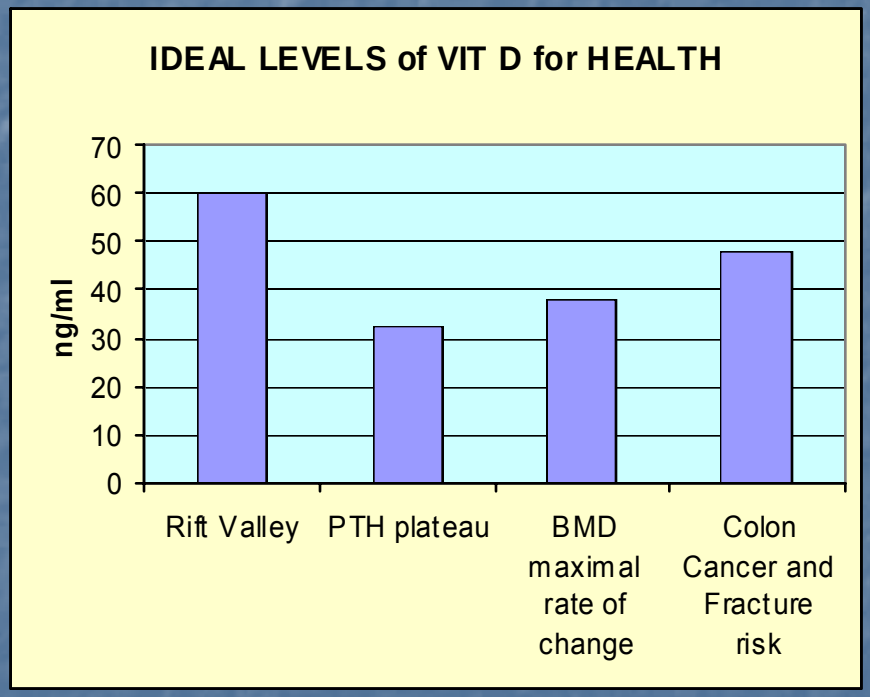
HEALTHY PEOPLE 2010 FOCUS AREAS

- Infant Mortality
- Cancer Screening and Management
- Cardiovascular Disease
- Diabetes
- HIV Infection/AIDS
- Immunizations

OPTIMAL VITAMIN D LEVELS FOR HEALTH

Level of 25(OH)D:

- measured by Dr. M. Holick in East Africa were 40-80ng/ml
- to plateau PTH & maximize calcium absorption 32ng/ml
- to maximize rate of BMD increase 36-40ng/ml
- for maximal LE function, falls, colorectal cancer incidence and fracture prevention >48ng/ml



Data for BMD, Colon Cancer and Fracture Risk adapted from Bischoff-Ferrari H, Giovanucci E, Willet W, Dietrich T, Dawson-Hughes B. Estimation of optimal serum concentrations of 25-hydroxyvitamin D for multiple health outcomes

Environmental Factors & Vitamin D

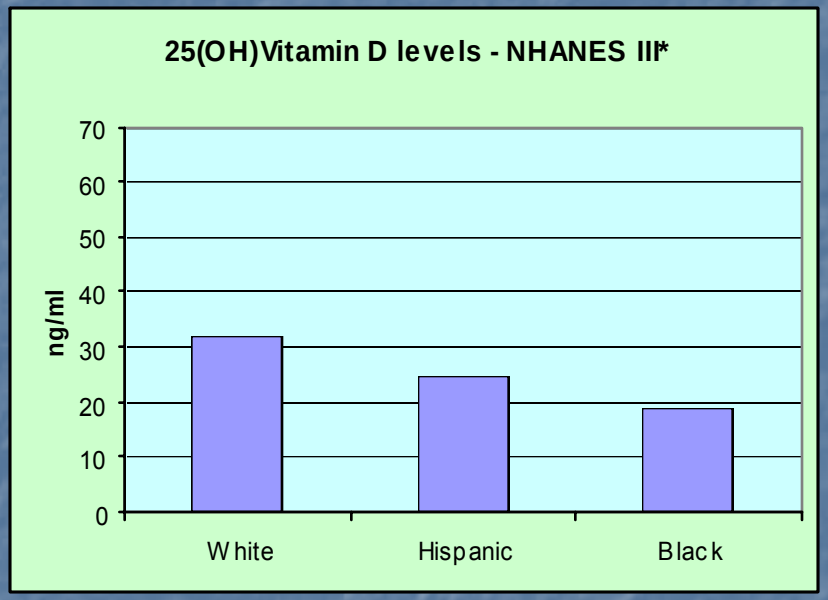
- Vitamin D is produced by the skin when exposed to UVB rays from the sun.
- Factors which inhibit transmission of those waves to human skin include
- Latitude and season, by their effect on the angle of traversal of the suns rays through the atmosphere
- Climatic conditions such as cloud cover.
- Land conditions such as forest cover, and building density

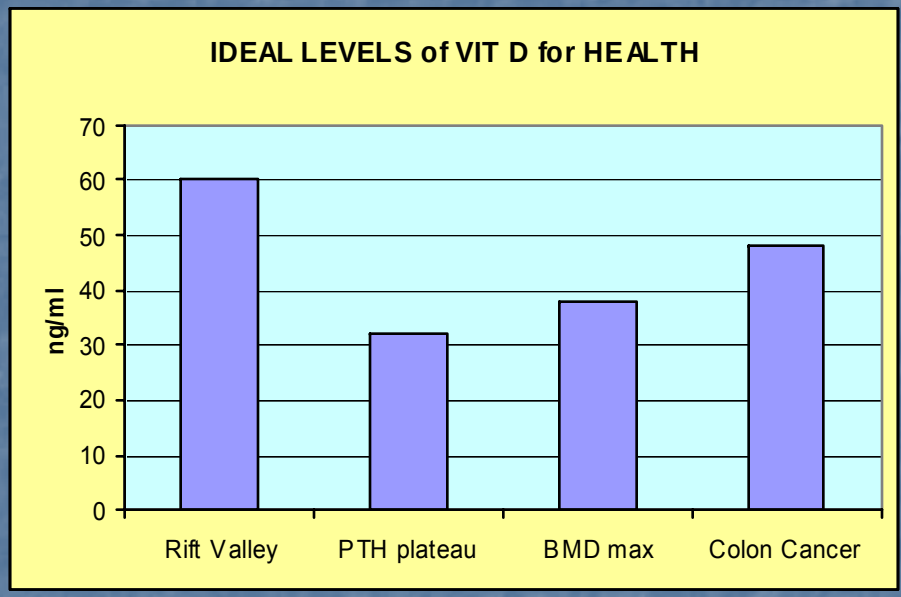
Environmental Factors & Vitamin D

Factors which inhibit transmission of UVB waves to skin include:

- Altitude, by affecting depth and density of the atmosphere traversed by UVB
- Clothing use due to temperature or culture
- Smog and air pollution
- Skin factors such as pigmentation, photosensitivity, use of sunscreen

U.S. Vitamin D Disparities

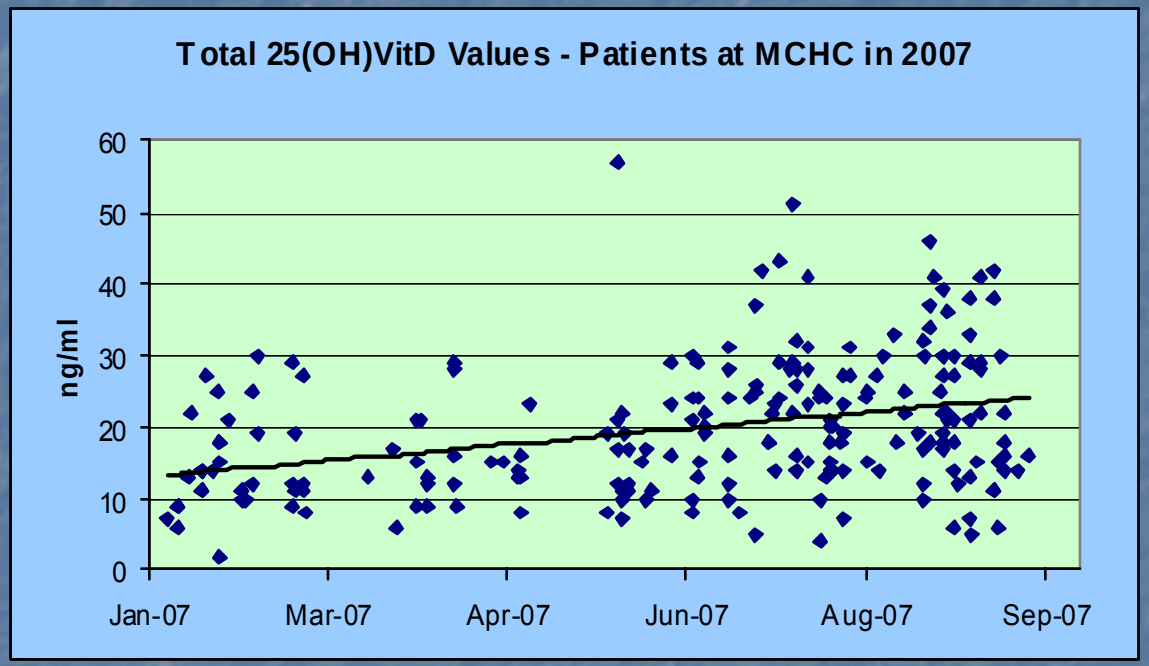




*From Martins D, Wolf M, Pan D, et al. Prevalence of Cardiovascular Risk Factors and the Serum Levels of 25-Hydroxyvitamin D in the United States. Arch Int Med 2007;167:1159-65 Data fromNHANES III

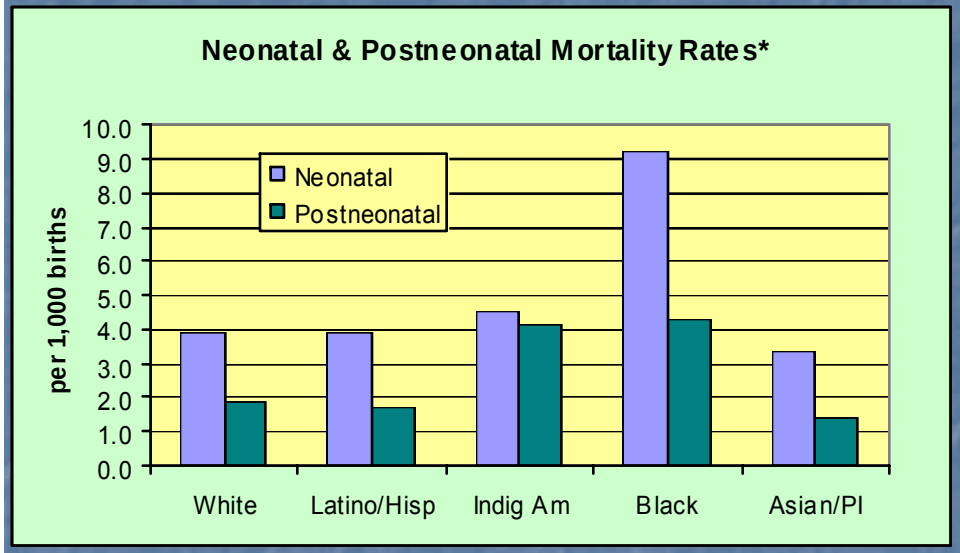
The Third National Health and Nutrition Examination Survey (NHANES III) was conducted 1988-94. There were 7186 male and 7902 female adults 20 years and older with available data in the Third National Health and Nutrition Examination Survey.

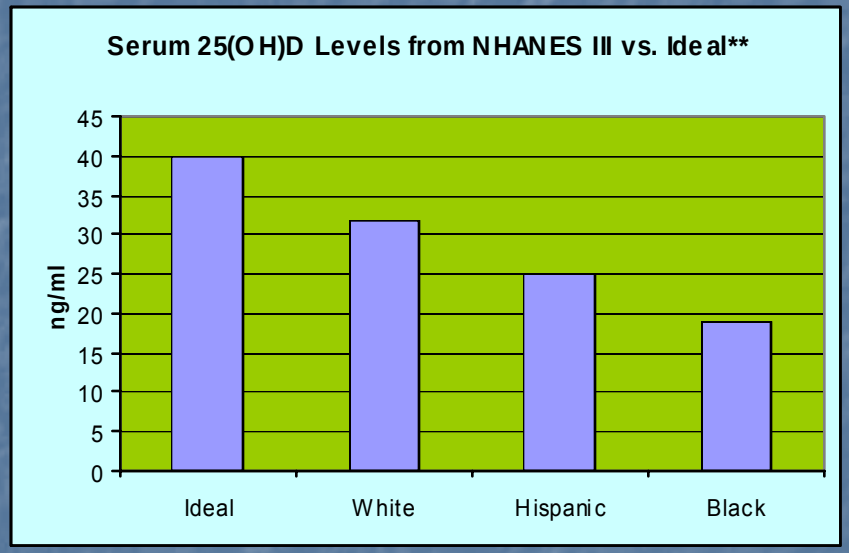
25(OH)Vit D levels of patients at Mattapan Community Health Center



- Two hundred seventeen patients entered into our database with baseline blood levels of 25(OH)D, not pretreated at MCHC
- Some patients may take supplements or be recent travelers

Infant Mortality & Vit D Disparities





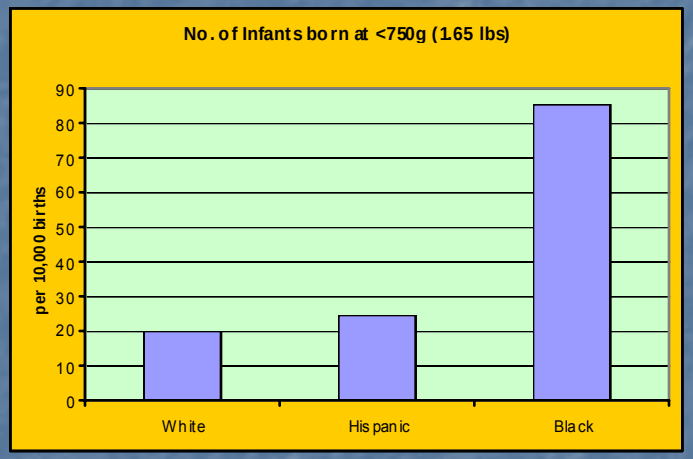
*From Table 19. Infant, neonatal and postneonatal mortality rates, by detailed race and Hispanic origin of mother

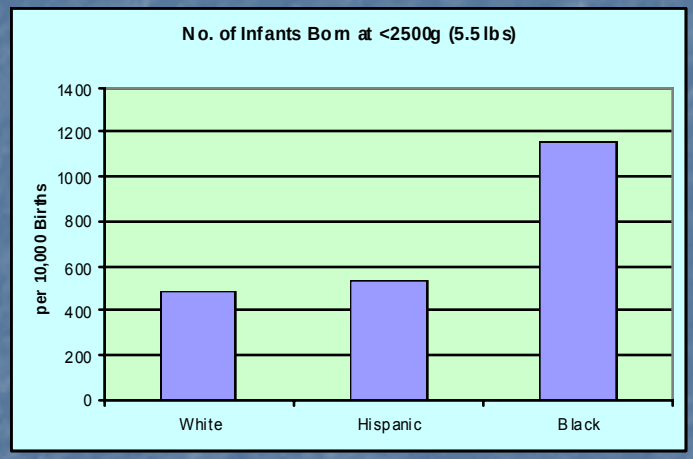
**From Martins D, Wolf M, Pan D, et al. Prevalence of Cardiovascular Risk Factors and the Serum Levels of 25-Hydroxyvitamin D in the United States. Arch Int Med 2007;167:1159-65 Data from NHANES III

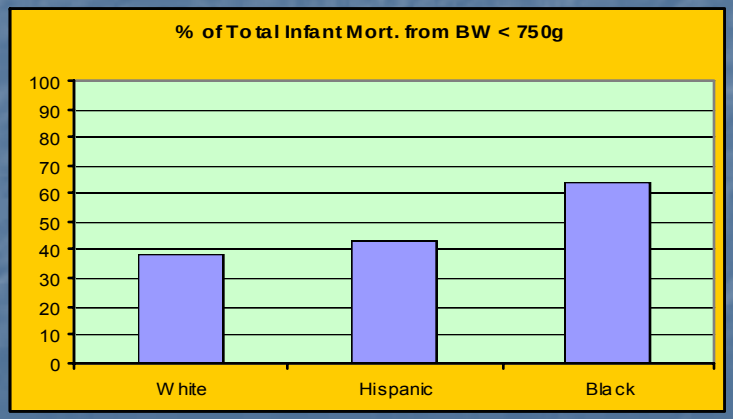
- The infant mortality rate, the risk of death during the first year of life, is related to the underlying health of the mother, public health practices, socioeconomic conditions, and availability and use of appropriate health care for infants and pregnant women.
- Disorders related to **short gestation and low birth weight**, and congenital malformations are the leading causes of death during the neonatal period (less than 28 days of life).
- **Infants born premature or low birth weight are more likely to die from SIDS**.

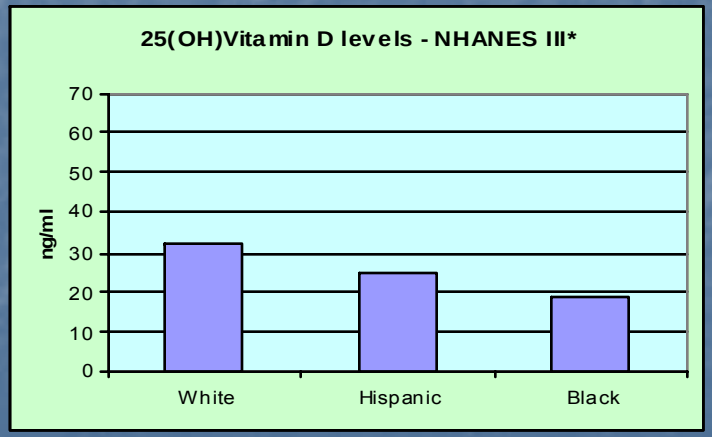
From the CDC Website on Infant Mortality

Infant Mortality & Vit D Disparities









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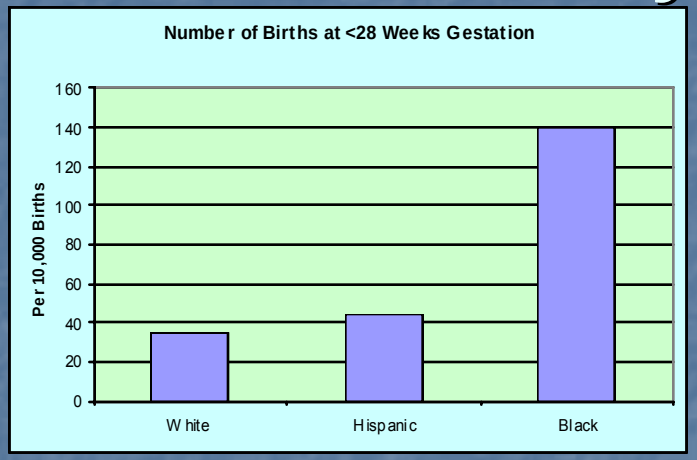

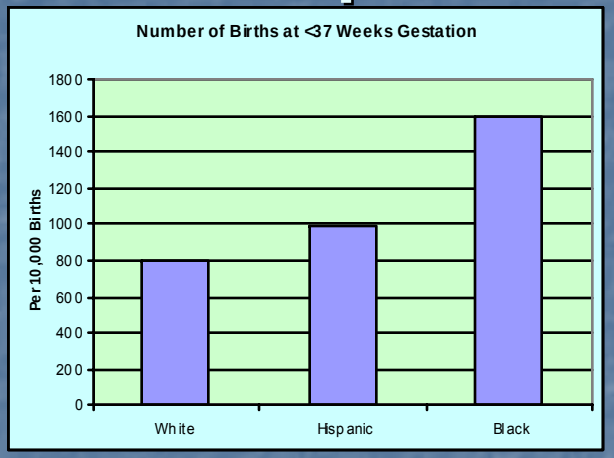

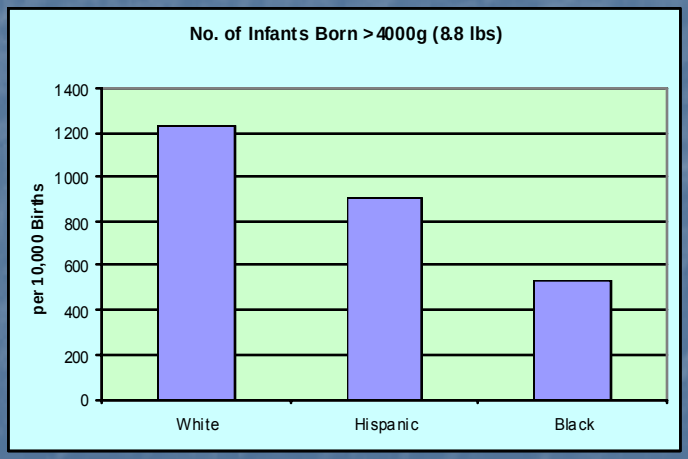

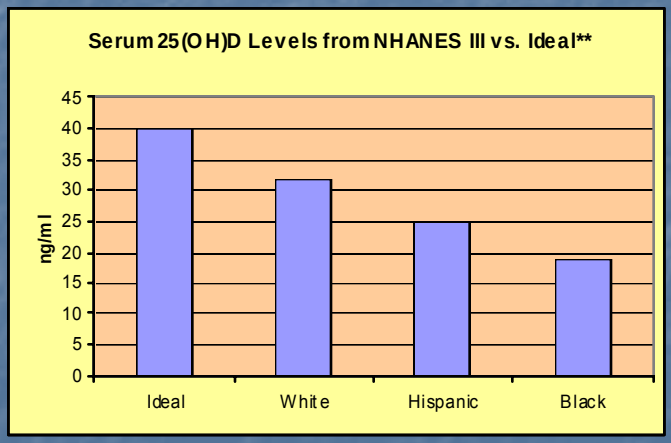

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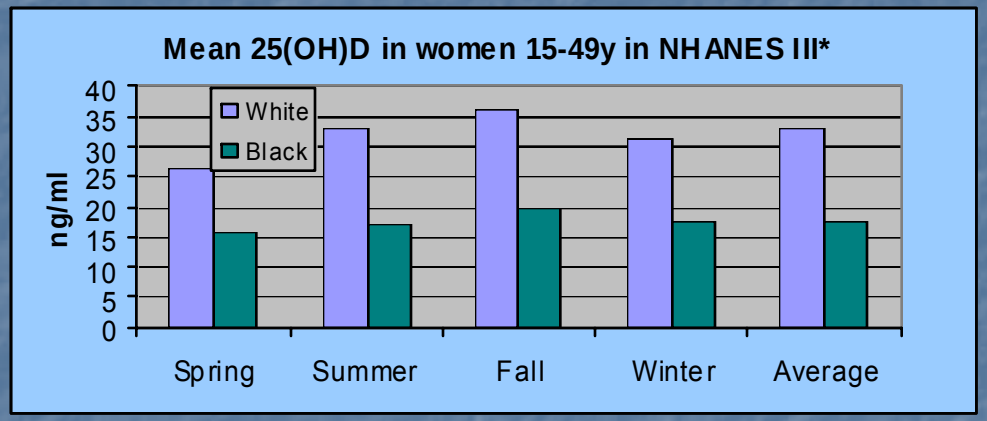
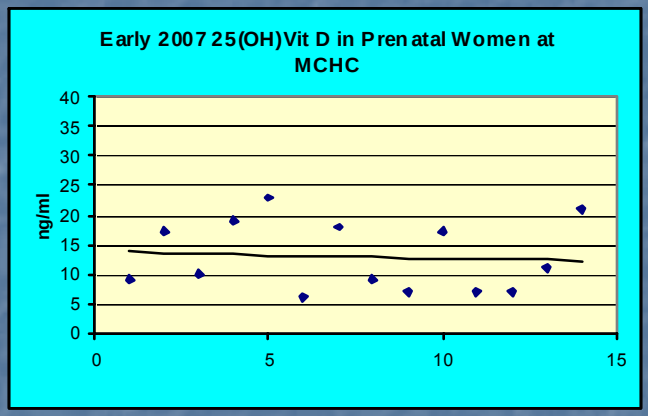
Infant Mortality & Vit D Disparities





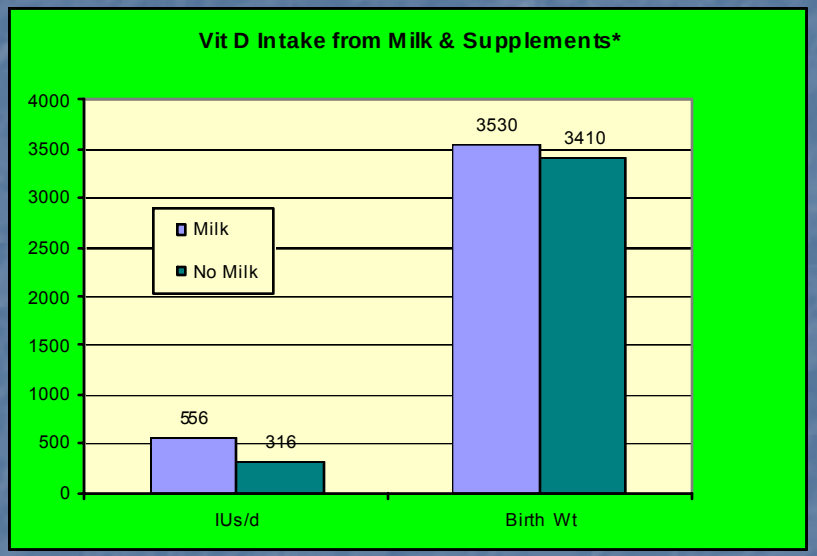
*from Hypovitaminosis D prevalence and determinants among african american and white women of rpoductive age: 3rd NHANES, 1988-1994, AJCN 2002;76:187-92

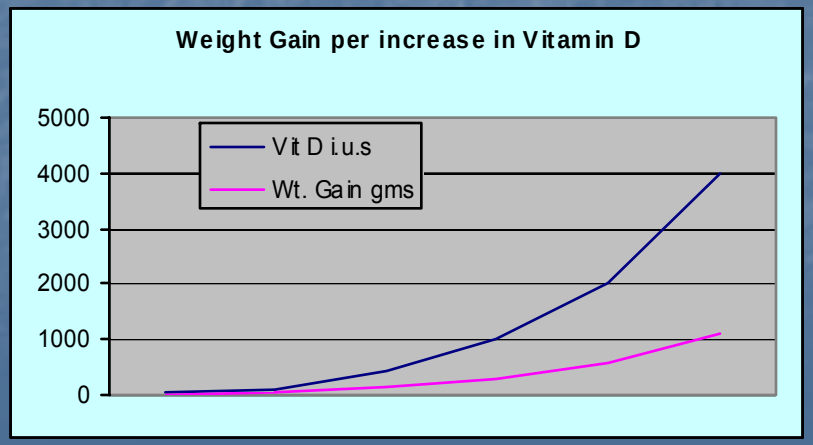
- Vit D levels noted in MCHC patients were taken at prenatal registration in January through April 2007 (& exclude 3 values due to prescribed Vit D & recent move from Haiti).

Vitamin D Status of the Fetus and Neonate

- In their review article Assessment of Vitamin D requirements during pregnancy and lactation, Bruce Hollis and Carol Wagner noted:
- Many studies show that fetal cord blood at birth contains 50-60% of the maternal 25(OH)VitD levels.
- In the fetus vitamin D metabolism appears to begin with 25(OH)VitD from the mother.
- The Vit D status of the fetus and neonate is totally dependent on the Vitamin D stores of the mother.

Infant Mortality & Vit D Disparities



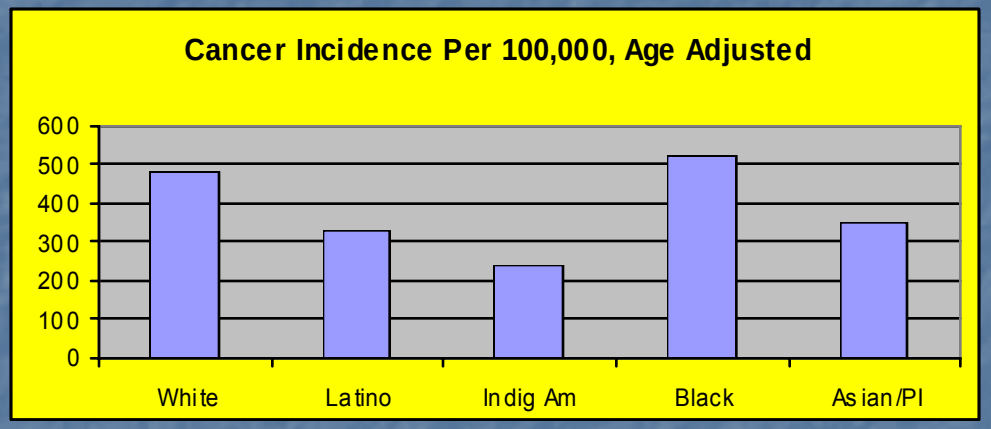


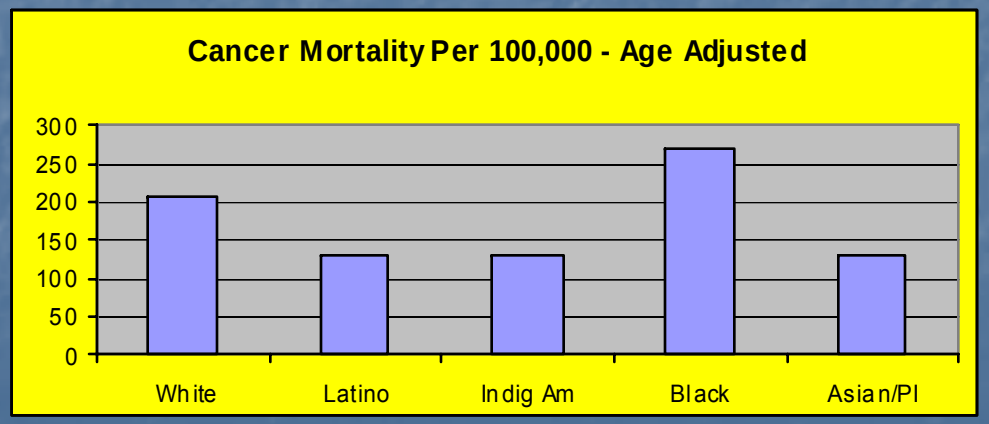
*From Association of low intake of milk and vitamin D during pregnancy with decreased birth weight -CMAJ April 25, 2006 174(9)

- 2091 women subjects
- Protein, calcium nor riboflavin predicted birth weight
- Each mcg, or 40iu, of vitamin D increase in intake daily was associated with an increase in birth weight of 11g.
- 2000iu/day would increase birth weight 1.2lbs.

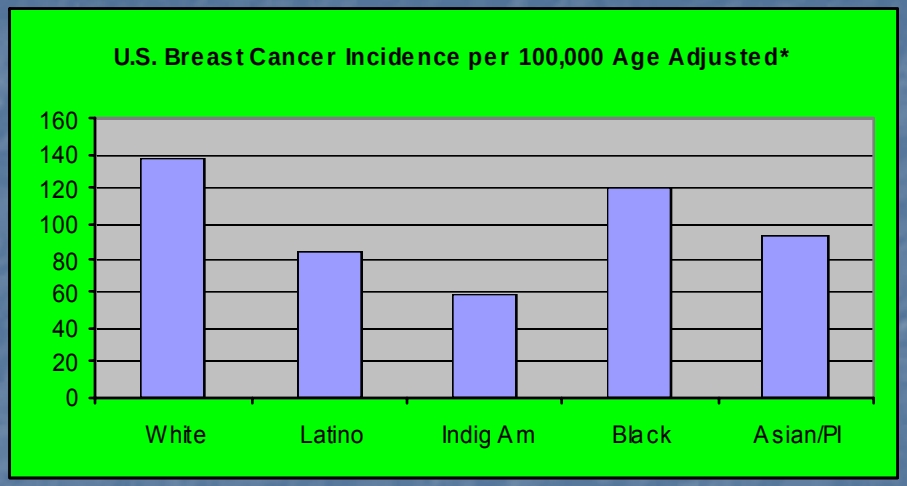
Cancer & Vit D Disparities

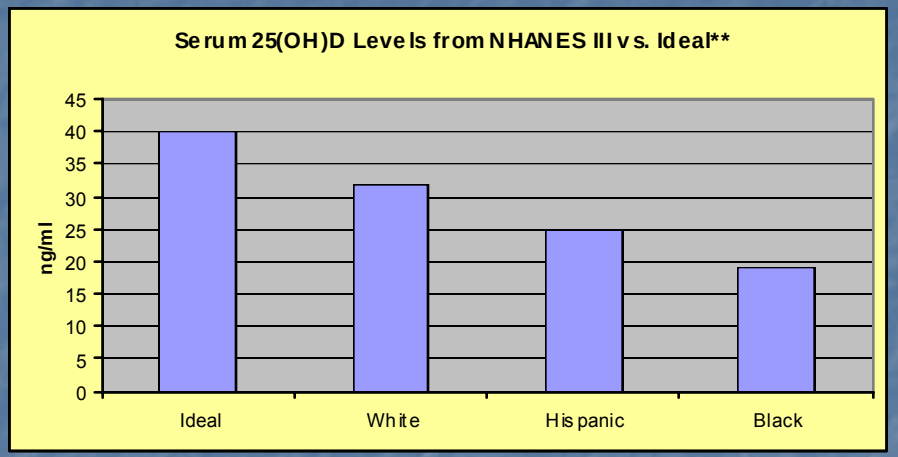
- Source data from Survival, Epidemiology and End Results Program, 1978-99, Div. Of CA Control and Pop. Sciences, NCI
- Health People 2010 target: Reduce cancer death rate by 21% to 159.9 deaths per 100,000 population

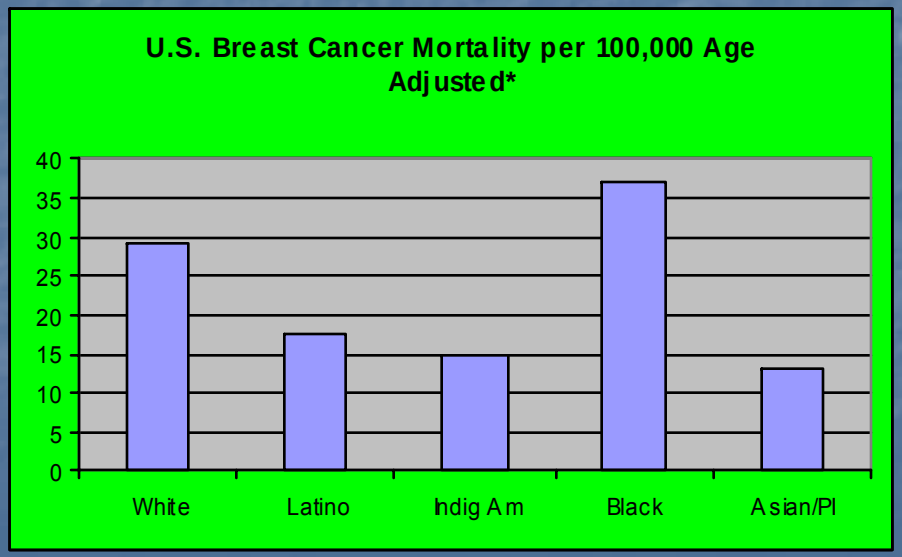


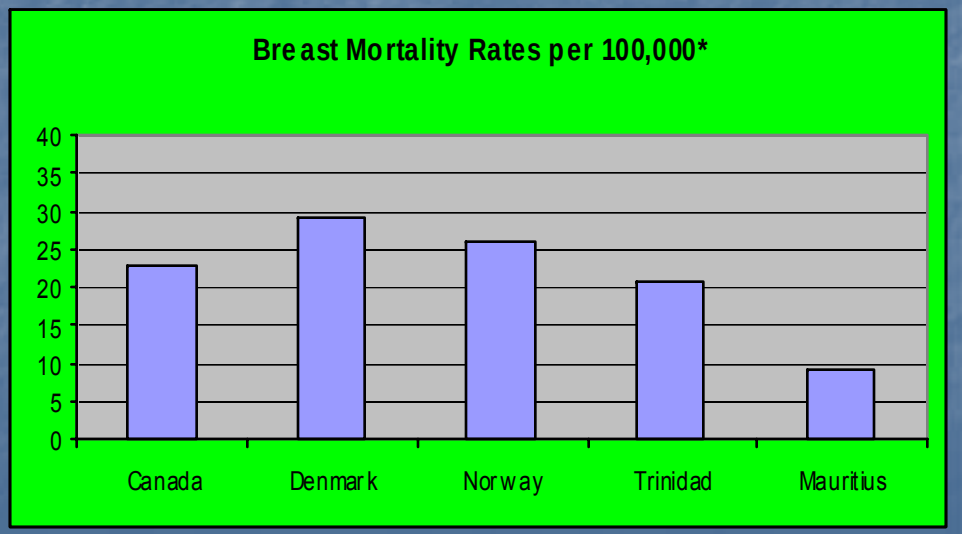


Cancer & Vit D Disparities









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Cancer & Vit D Disparities

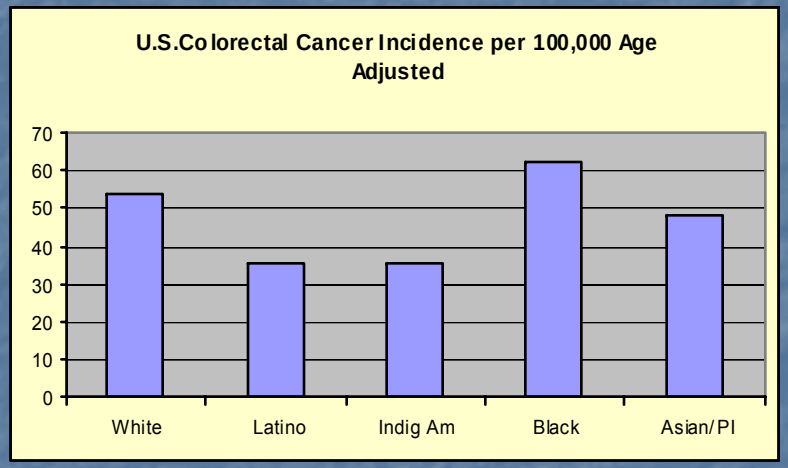
Breast Cancer Risk Occurrence Rates

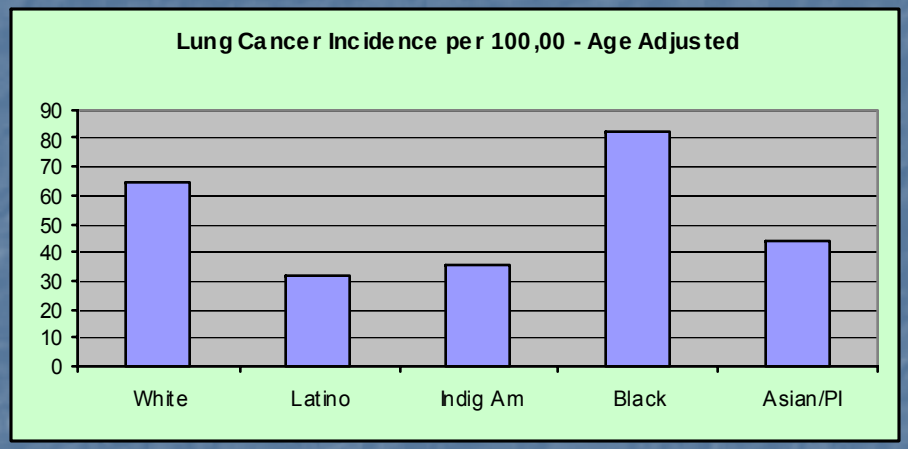
Sun Exposure	Lowest Quartile	Highest Quartile
Outdoor Activities, ages 10 - 19	1	0.65
	None	Any
Cod Liver Oil Use, ages 10-19	1	0.76
	None	≥ 10 glasses/week
Milk Consumption, ages 10-19	1	0.62

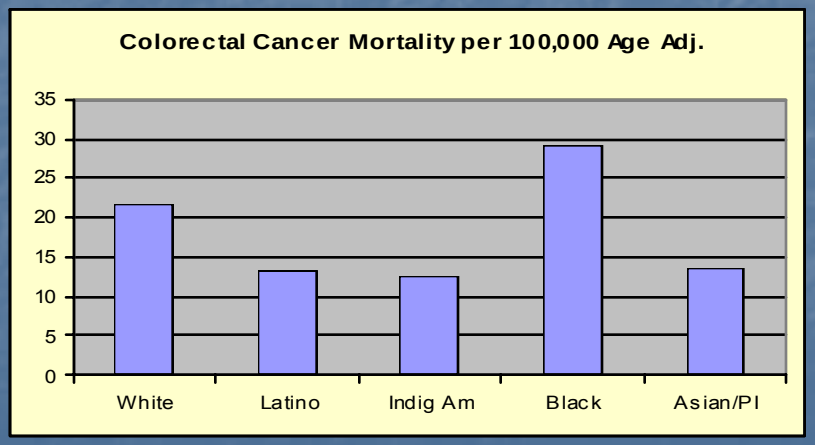
From Vitamin D and reduced Risk of Breast Cancer: A Population-Based Case-Control Study - Cancer Epidemiology Biomarkers & Prevention 16(3): 422-29

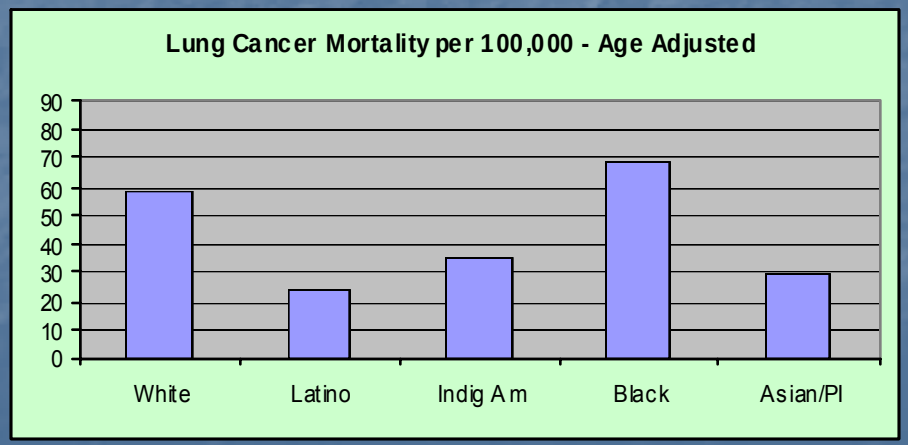
- There was weaker evidence for associations from ages 20 to 29 and no evidence for ages 45 to 54.
- These results suggest that exposure earlier in life, especially during breast development, may be most relavent.

Cancer & Vit D Disparities









from Survival, Epidemiology and End Results Program, 1978-99, Div. of CA Control and Pop. Sciences, NCI

Cancer & Vit D Disparities

25(OH) Vit D levels and colorectal Cancer Risk

Quintiles	1rst	2nd	3rd	4th	5th
2000 Mean 25(OH)D ng/ml	14.9	19.6	24.1	27.9	35.3
2003 Mean 25(OH)D ng/ml	17.4	24.8	29.6	34.5	44.5
Colorectal Ca Cases	53	47	35	29	29
Risk	1	0.89	0.66	0.55	0.55

Adapted from Table2 in Feskanich D, Ma J, et al: Plasma Vitamin D Metabolites and Risk of Colorectal Cancer in Women Cancer Epidem, Biomarkers & Prevention 13(9):1502-8, Sep 2004

- The Nurses Health Study involves 127,000 women aged 30-55 at its initiation, who are 98% white.

Cancer & Vit D Disparities

Survival Among 447 Patients with Early-Stage NSCLC

	serum25(OH)D		
	lowest Q	highest Q	high level & intake by medians
Overall Survival	1	0.74	0.64
Stage IB-IIB	1	0.45	similar to above

From abstract of Zhou W, Heist R, et al. Circulating 25-Hydroxyvitamin D Levels Predict Survival in Early-Stage Non-Small-Cell Lung Cancer patients Jnl Clin Onc 25(5): 479-85 2/10/2007

- Involved 447 patients with early NSCLC followed up to 12 years. There were 161 recurrences and 234 deaths
- Stronger associations noted with IB-IIB than IA stage
- Similar benefits seen for recurrence free survival

Cancer & Vit D Disparities

Cancers by Site and Treatment Arm Years 2 – 4

	Placebo	Ca++ only	Vit D + Ca++
# of Pts	(266)	(416)	(403)
Breast	7	6	4
Colon	2	0	0
Lung	3	2	1
Heme System	4	4	2
Uterus	0	1	0
Other	2	2	1
Total	18(6.8)	15 (3.7)	8 (2.0)

Baseline and 12 mo. serum 25(OH) Vit D Values

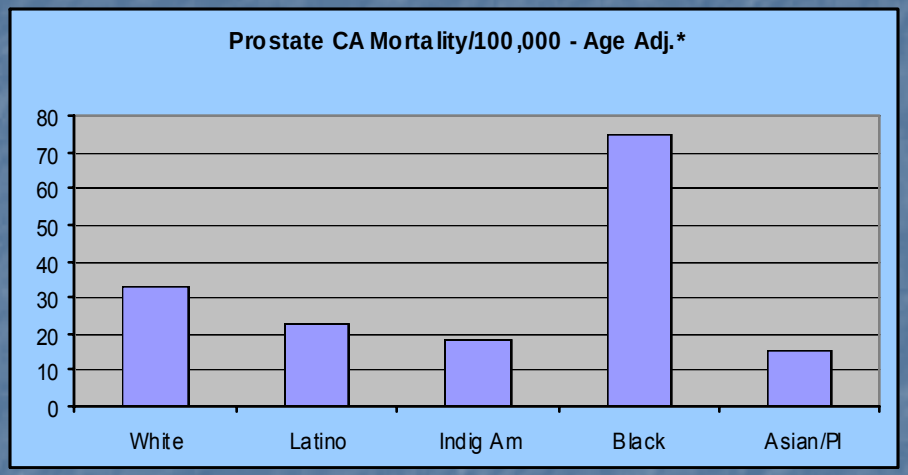
	Baseline	12 mo	Change
Placebo	28.8	28.4	-0.4
Calcium only	28.6	28.4	-0.2
Ca++ plus Vit D *	28.7	38.4	9.7

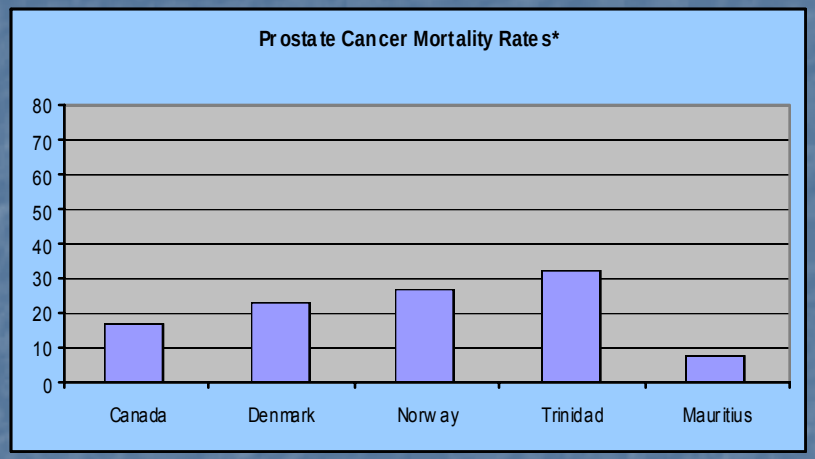
* 1100u of Vit D3 per day

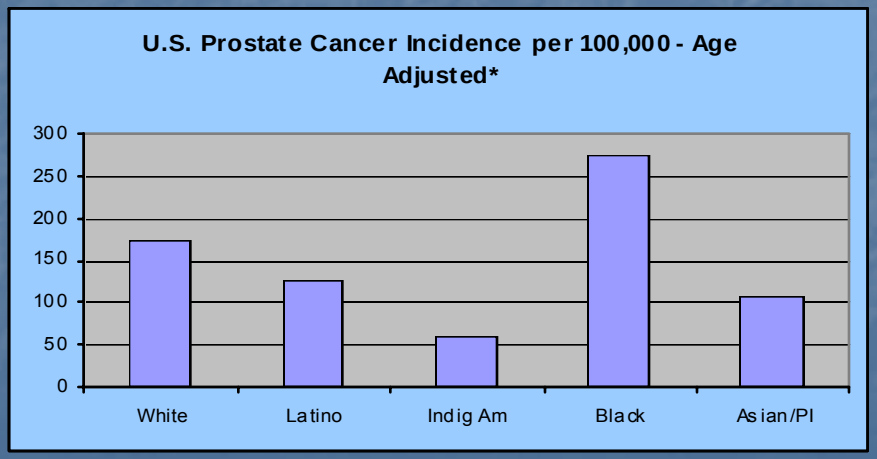
From Lapp J, Tavers-Gustafson D, Davies K, et al. Vitamin D and Calcium Supplementation reduces cancer risk: results of a ranomized trial- AJCN 2007;85:1589-91

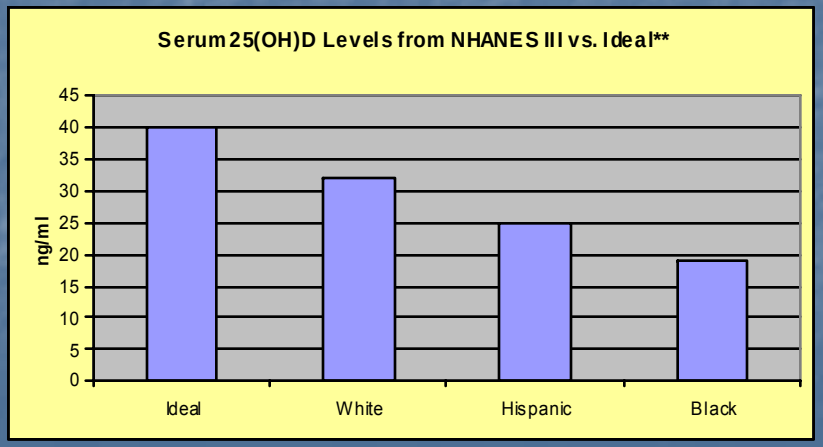
- With analysis confined to cancers diagnosed after the first 12 months of the study, from years 2 – 4, relative risk dropped to 23% for the Vit D + Calcium arm compared to placebo.

Cancer & Vit D Disparities









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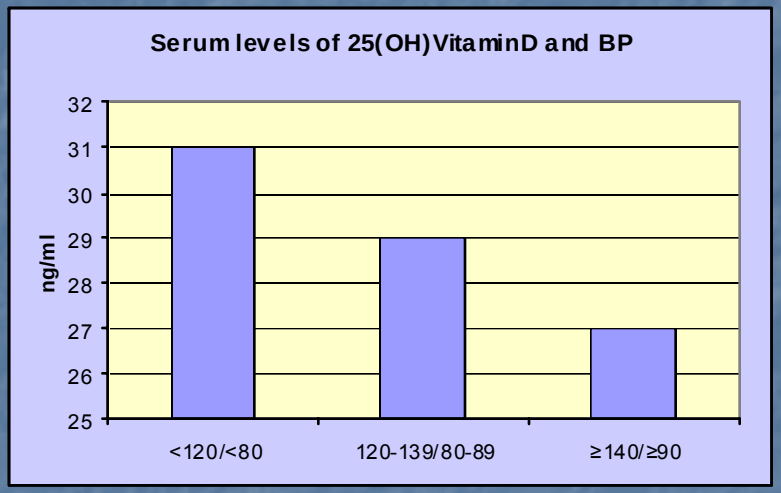
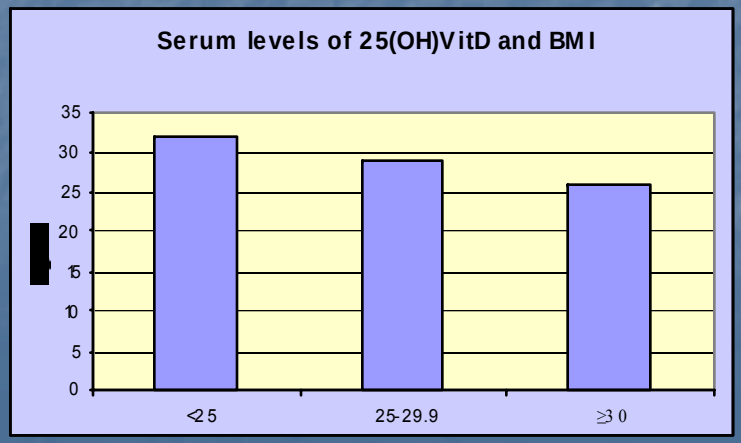
Cardiovascular & Vit D Disparities

- Low 25(OH)D levels and intake are associated with:
  - Hypertension
  - Diabetes
  - Congestive Heart Failure
  - Obesity
  - Metabolic Syndrome
- Vitamin D also reduces proliferation of lymphocytes and production cytokines which play an role in the genesis of atherosclerosis
- Low vitamin D levels have been associated with increased arterial wall calcification

Cardiovascular & Vit D Disparities





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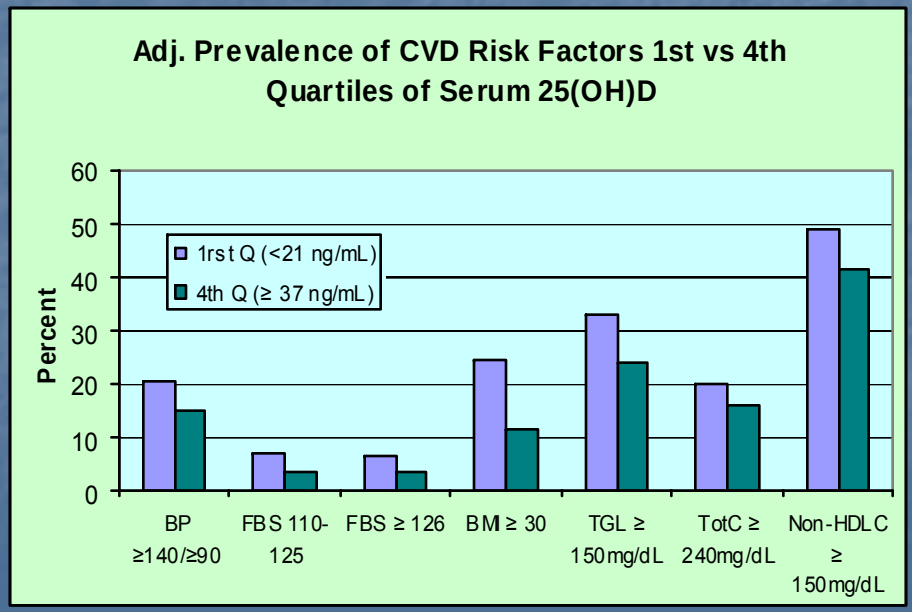
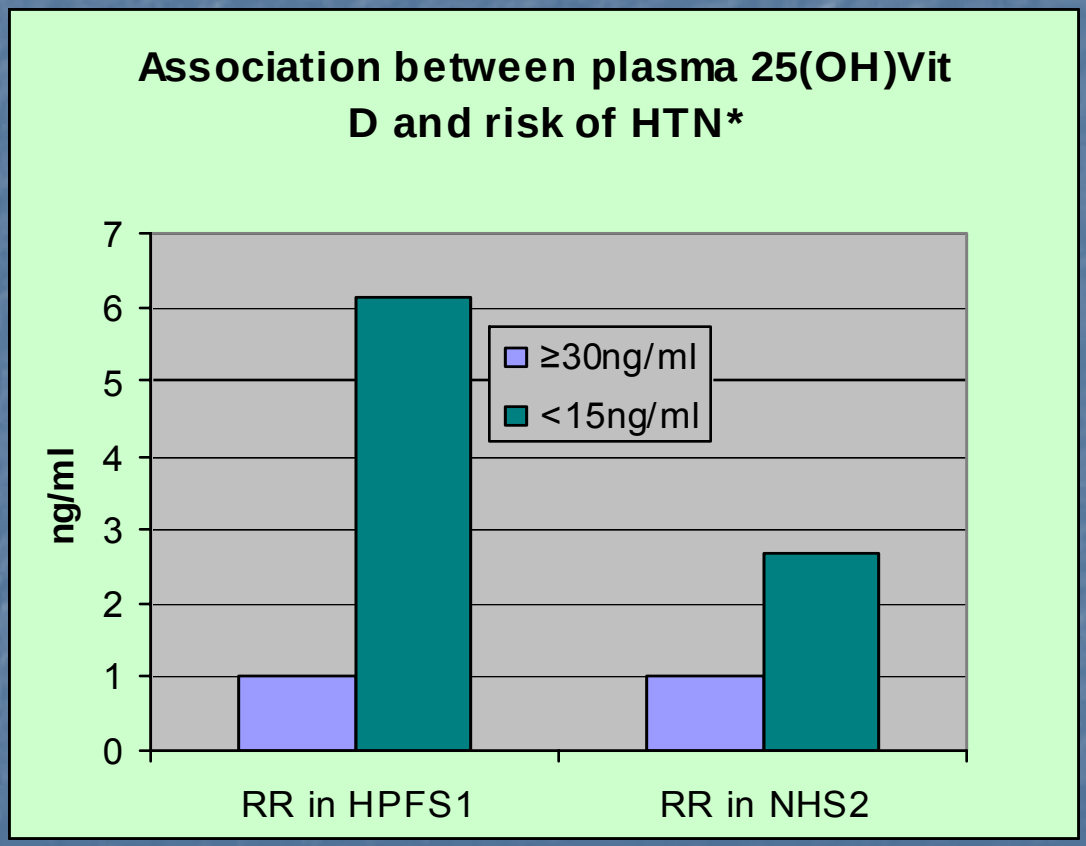


Cardiovascular & Vit D Disparities

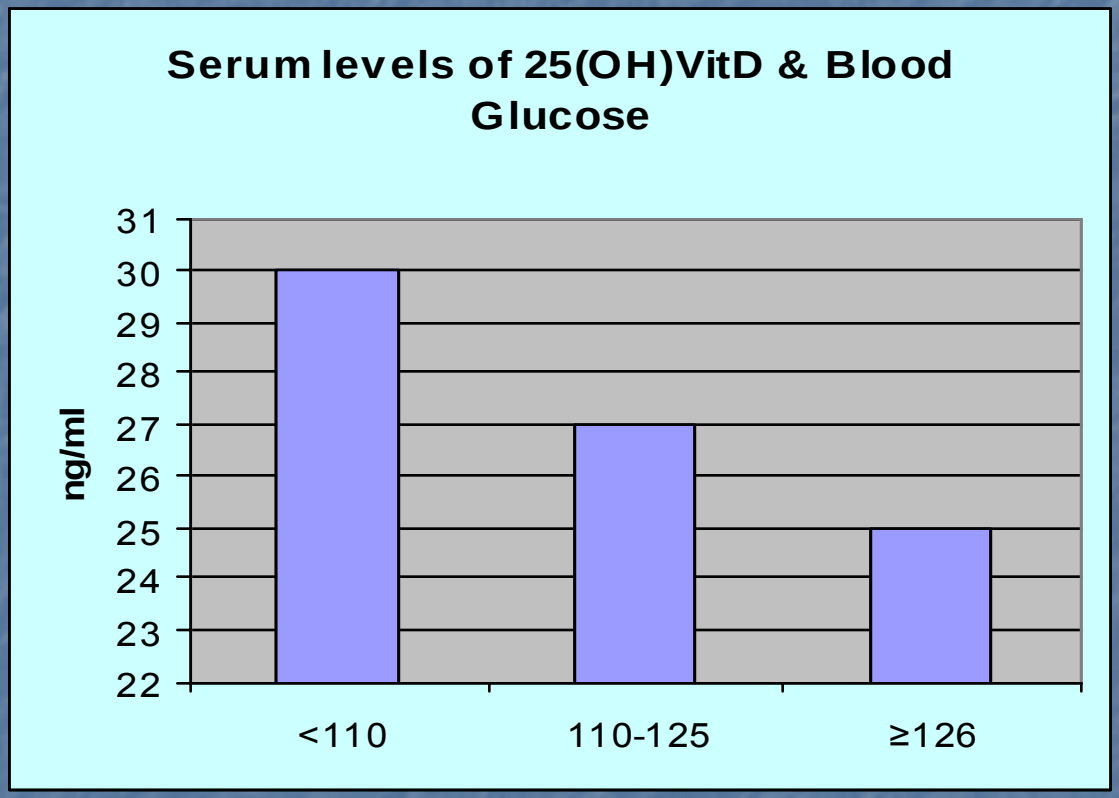


*from abstract of Plasma 25-Hydroxyvitamin D Levels and Risk of Incident Hypertensions - Forman J, Giovannucci E, et al: Hypertension 2007;49:1063

Diabetes & Vitamin D Disparities

- Animal studies show insulin released from the pancreas in vitamin D deficient animals is lower than for controls.
- Insulin sensitivity in humans is positively associated with serum 25(OH)D and increased by Vitamin D supplementation.
- Low Vitamin D is associated with elevated PTH, which in turn is associated with increased insulin resistance and diabetes. Parathyroidectomy improves glucose tolerance in these patients.

Diabetes & Vitamin D Disparities



From Martins D, Wolf M, Pan D, et al. Prevalence of Cardiovascular Risk Factors and the Serum Levels of 25-Hydroxyvitamin D in the United States. Arch Int Med 2007;167:1159-65 Data fromNHANES III

Vitamin D and Total Mortality

Vitamin D Supplementation and Total Mortality
Archives of Int Med 9/10/07 167(16):1730 - 37

- Literature up to November 2006 searched without language restriction – databases PubMed, ISI Web, EMBASE, Cochrane
- 18 randomized controlled trials
- vitamin D given for any health condition
- death was an outcome reported

Vitamin D and Total Mortality

Vitamin D Supplementation and Total Mortality

Archives of Int Med 9/10/07 167(16):1730 - 37

- 57,311 participants
- 4777 deaths
- Trial mean 5.7 years (6 – 84 months)
- Mean VitD dose: 528iu (300 – 2000iu)

Vitamin D and Total Mortality

Vitamin D Supplementation and Total Mortality
Archives of Int Med 9/10/07 167(16):1730 - 37

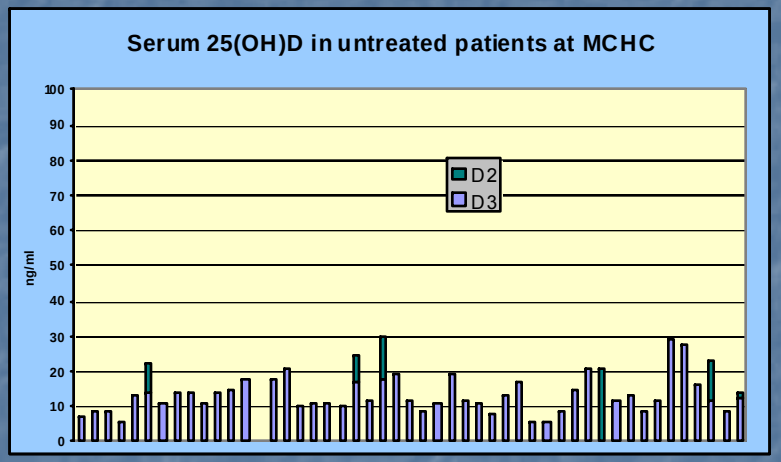
Mortality Rates:

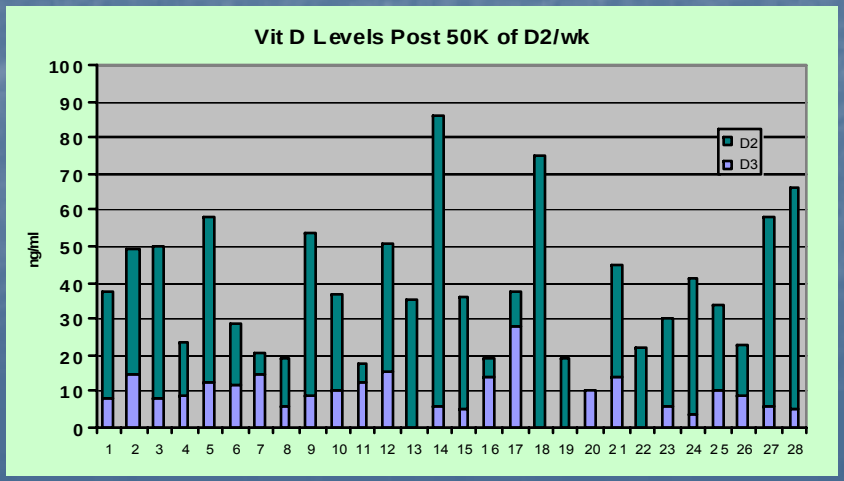
- VitD subjects 7% less than control
- Trials ≥ 3 yrs: VitD subjects 8% less
- VitD + Calcium subjects 7% less
- VitD supp. alone subjects 9% less
- Placebo controlled, VitD 8% less

Dosing in Vitamin D Deficiency

Dosing of Vitamin D:

- Data in multiple studies show that Vitamin D levels increase ~1ng/ml for every 100iu of Vitamin D intake a day with both D2 and D3 supplements.
- Soon to be published data from a study involving Mattapan Community Health Center patients bear out this general relationship, and show little difference between elevations seen with D3 and D2 supplements, averaging 11 & 9 ng increases respectively (at MCHC), and varying considerably from patient to patient.
- MCHC patients shown in lower graph had been on 50,000iu of ergocalciferol from 3 – 6 mo.s

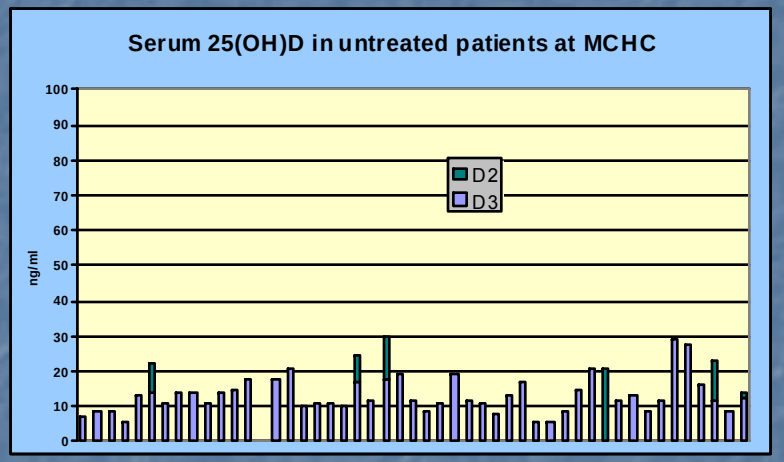


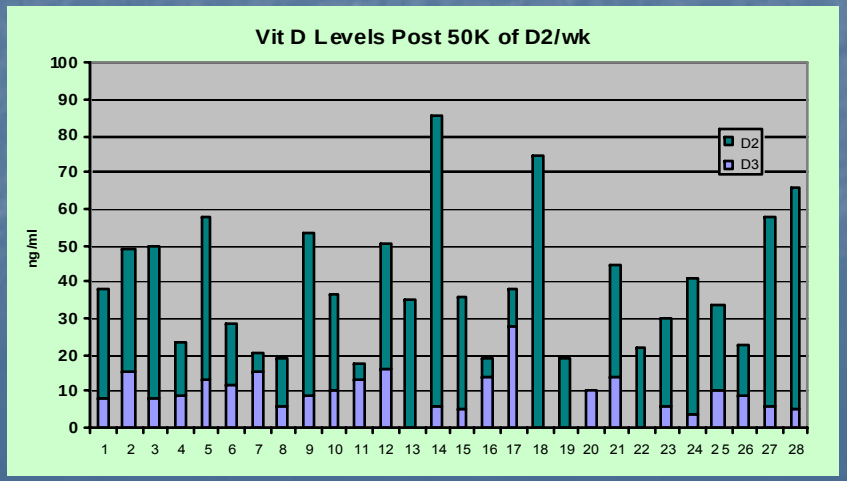


Dosing in Vitamin D Deficiency

Dosing of Vitamin D:

- Vit D levels increase ~1ng/ml per 100iu of Vitamin D intake a day.
- MCHC patients shown in lower graph had been on 50,000iu of D2/wk from 3–6 mo.s





Dosing in Vitamin D Deficiency

- Data from MCHC patients show no signif. difference between D3 & D2 supplements, with 11 & 9 ng increases resp., but varying considerably from patient to patient.
- In patients with insufficiency we begin tx'ment with 50,000iu of D2 per week for 2 mo.s, then give 2,000iu D3 or 50,000iu D2 twice a month for maintenance.
- Reassessment of blood levels of 25(OH)D is key for proper supplementation