



# Vitamin D Supplementation Among Women of Childbearing Age: Prevalence and Disparities



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# Deficiency Associations

- Cardiovascular disease
- Cancers
- Metabolic disease
- Low bone strength
- Autism
- Multiple sclerosis
- Diabetes
- Mental illness
- Obesity-related illnesses
- All-cause mortality



# Deficiency

# Pregnancy Associations

- Fertility
- Higher Caesarian rates
- Lower birth weight
- Gestational diabetes
- Preterm delivery
- Preeclampsia,
- Infant fetal development,
- Infant muscular and bone development
- Child adiposity risks.



# Deficiency Prevalence

Widespread across virtually all populations. **Disparities exist.**

**More prevalent among:**

**Women** than men

**Pregnant women** than non-pregnant women

**Children** than young adults

Along lines of **race/ethnicity**



# Exacerbating Disparities

## Parallel **Nutritional** Disparities

Parallel disparities for **associated health risks**



**Obesity**  **Vitamin D deficiency**



# Winter is Play-Time for Healthy Childhood

and is "cold-time" for delicate, puny children.

If mothers everywhere would fully appreciate the strength-building, blood-making nourishment in **Scott's Emulsion** they would give it to children after their meals.

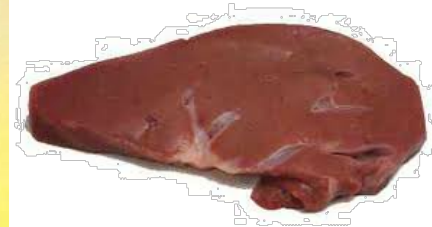
Its cream-like Cod Liver Oil brings healthy flesh and rosy cheeks while it warms the body by enriching the blood and fortifies the lungs.

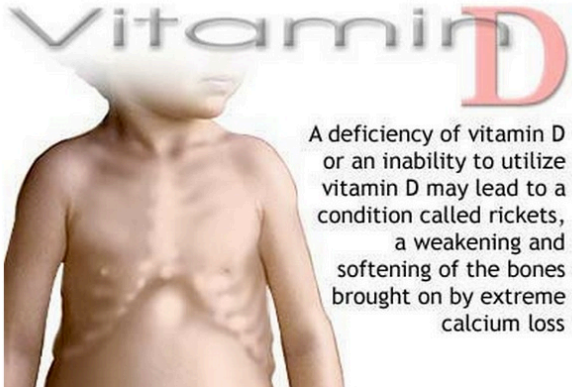
No Alcohol in SCOTT'S. Avoid Substitutes.

14-91 SCOTT & BOWNE, BLOOMFIELD, N. J.



## Sources of Vitamin D





A deficiency of vitamin D or an inability to utilize vitamin D may lead to a condition called rickets, a weakening and softening of the bones brought on by extreme calcium loss

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HEART TO HEART

5 Reasons Women Should Still Take Vitamin D

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adding pediatricians group says children from newborn nt of vitamin D because of evidence that it may help ;

Harvard Women's Health Watch

HARVARD MEDICAL SCHOOL

PERSONAL HEALTH

An Oldie Vies for Nutrient of the Decade

By JANE E. BRODY

Published: February 19, 2008

The so-called sunshine vitamin is poised to become the nutrient of the decade, if a host of recent findings are to be believed. Vitamin D, an essential nutrient found in a limited number of foods, has long been renowned for its role in creating strong bones, which is why it is added to milk.

The Seattle Times

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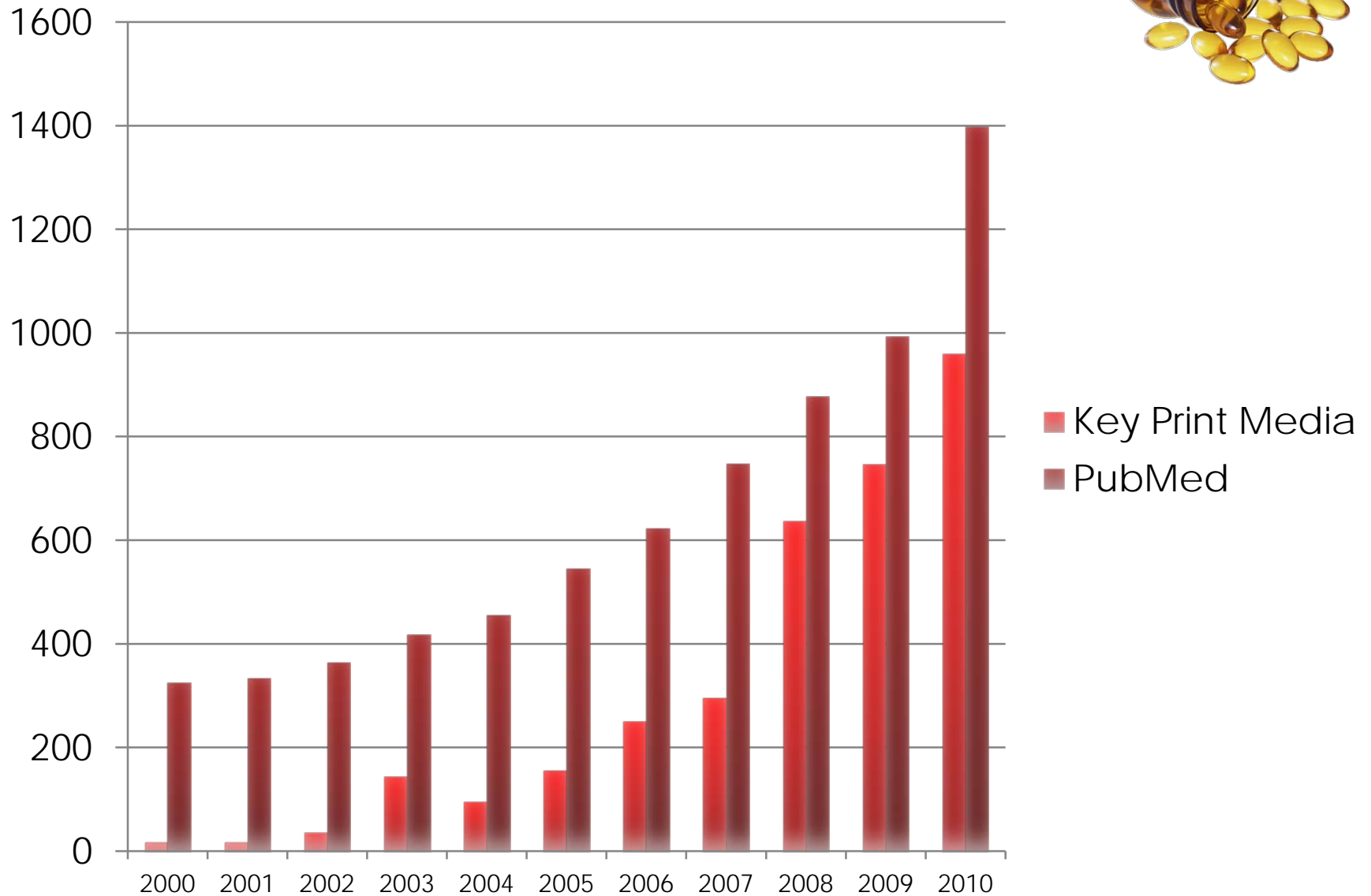
Does our lack of sun put your hea

The Northwest's dreary winters are infamous for inducing depression. But a growing body of evidence st your risk of cancer and increase susceptibility to other diseases, such as diabetes.



Now a growing legion of medical researchers have raised strong doubt: of currently recommended levels of in through the sunset years. The researc

# Attention to Vitamin D



# Supplementation Among Women of Childbearing Age



# Research Aims



- Examine the **prevalence, disparities, and predictors** of vitamin D supplementation among women of childbearing age (16-49 years) in the United States and within multiple subgroups in three broad areas:
  - Demographic
  - Socioeconomic
  - Health

# Study Design



## Format

- Population-based cross-sectional secondary analysis

## Source

- NHANES (National Health And Nutrition Examination Survey) CDC NCHS

# Study Design



## Population

- Women of childbearing age (16-49) (n=1749)

## Years

- 2007-2008 Survey Data

# Methods and Variables



## Age

- 16-19
- 20-35
- 36-49

## BMI

- <25
- 25-30
- 30-35
- $\geq 35$

## Waist Circumference

- <35 inches
- $\geq 35$  inches

# Methods and Key Variables



## Vitamin D Supplement Intake

- 30 Days
- 1, 2 Day 24-hour recall
- Duration of Intake
- Dose (IU)

# Methods and Variables



## Tried to lose weight in past year

- 16-19
- 20-35
- 36-49

## Diabetes

- Doctor told had diabetes
- Diabetes during pregnancy

## Race/Ethnicity

- Mexican-American
- Other Hispanic
- Non-Hispanic White
- Non-Hispanic Black
- Other or Multi-Racial

# Methods and Variables



## Years in the US

- 1-2 (non-citizens)
- 3-5 (non-citizens)
- 6-10 (non-citizens)
- 10+ (citizens & non-citizens)

## Household Income

- <\$25,000 per year
- \$25,000-\$45,000 per year
- \$45,000-\$65,000 per year
- \$65,000-\$75,000 per year
- >\$75,000 per year

## Food Security (adult)

- Full food security
- Marginal food security
- Low food security
- Very low food security

# Methods and Variables



## Health Insurance Status

- Insured
- Private Insurance
- Government
- Uninsured

## Education Level Age 16-19

- At grade level
- Below grade level

## Education Level Adult

- Less than high school
- High school/GED/equiv.
- Some college or AA
- College graduate or above

# Methods and Variables



## Parity

- Has been or is pregnant
- Never been pregnant
- Has breastfed a child 1+ mo
- Has never breastfed a child

## Moderate or Vigorous Exercise

- None
- Avg 1-30 minutes per day
- Avg 30+ minutes per day

## Vitamin D Intake from Food

- < 400 IU from food avg day
- $\geq 400$  IU from food avg day



# Results

- Of total 1749 Women,  
459 or 33% took  
Vitamin D supplements  
in the last 30 Days

# Results



Age	n total	n supplementing
16-19	290	47 (23.2%)
20-35	739	188 (30.7%)
36-49	720	224 (37.7%)

# Results



Waist Circumference	n total	n supplementing
< 35 inches	766	222 (36.6%)
≥ 35 inches	983	237 (29.7%)

# Results



<b>Race/Ethnicity</b>	<b>n total</b>	<b>n supplementing</b>
<i>Mexican-American</i>	363	63 (18.3%)
<i>Other Hispanic</i>	233	53 (22.7%)
<i>Non-Hispanic White</i>	690	228 (37.4%)
<i>Non-Hispanic Black</i>	390	93 (26.2%)
<i>Other Race or Multi-Racial</i>	73	22 (34.6%)

# Results



Years in US	n total	n supplementing
1-2 ( <i>non-citizens</i> )	76	11 (15.8%)
3-5 ( <i>non-citizens</i> )	232	58 (31.9%)
6-10 ( <i>non-citizens</i> )	92	23 (27.5%)
10+ ( <i>citizens &amp; non-citizens</i> )	1349	367 (33.8%)

# Results



Household Income	n total	n supplementing
<\$25,000 per year	161	28 (20.3%)
\$25,000-\$45,000 per year	145	47 (36.7%)
\$45,000-\$65,000 per year	253	67 (32.2%)
\$65,000-\$75,000 per year	98	30 (35.1%)
>\$75,000 per year	399	161 (44.9%)

# Results



Food Security	n total	n supplementing
<i>Full food security</i>	1160	347 (36.9%)
<i>Marginal food security</i>	257	59 (23.7%)
<i>Low food security</i>	205	36 (18.8%)
<i>Very low food security</i>	116	16 (18.7%)

# Results



Health Insurance	n total	n supplementing
<i>Insured</i>	1255	375 (26.2%)
<i>Private Insurance</i>	884	310 (40.4%)
<i>Government</i>	379	66 (20.5%)
<i>Uninsured</i>	491	84 (21.3%)

# Results



Education Level Youth 16-19	n total	n supplementing
<i>At grade level</i>	265	43 (23.9%)
<i>Below grade level</i>	25	4 (12.3%)

# Results



<b>Education Level Adult</b>	<b>n total</b>	<b>n supplementing</b>
<i>Less than high school</i>	375	55 (17.9%)
<i>High school/GED/equiv.</i>	323	77 (27.3%)
<i>Some college or AA</i>	473	152 (37.3%)
<i>College graduate or above</i>	287	128 (46.8%)

# Results



Parity	n total	n supplementing
<i>Has been or is pregnant</i>	1039	301 (35.6%)
<i>Never been pregnant</i>	237	69 (33.9%)
<i>Has breastfed a child 1+ mo</i>	572	187 (40.4%)
<i>Has never breastfed a child</i>	412	91 (25.5%)

# Results



Exercise	n total	n supplementing
<i>None</i>	899	187 (25.1)
<i>Avg 1-30 minutes per day</i>	91	34 (43.1)
<i>Avg 30+ minutes per day</i>	759	238 (38.6)
<i>None</i>	899	187 (25.1)

# Results



D Intake from Food	n total	n supplementing
< 400 IU from food avg day	1672	433 (32.5%)
≥400 IU from food avg day	77	26 (42.4%)

# Results



PARTICIPANTS	Total	DURATION OF ONGOING VITAMIN D SUPPLEMENT USE n (%)		
		≤1 year	1-2 years	>2 years
Women of childbearing age	1749	241 (44.7%)	58 (14.9%)	160 (40.4%)

# Results



PARTICIPANTS	Total	AVG DOSE PER DAY (30 day) (IU)* n (%100)		
		[low] $\leq 400$	[med] >400 & <800	[high] $\geq 800$
Women of childbearing age	1749	345 (73.0%)	46 (12.7%)	64 (14.3%)

## Predictors of Supplementation -- Age



tookDinlast30days	Linearized					[95% Conf. Interval]	
	Odds Ratio	Std. Err.	t	P> t			
age16_19	.5001624	.121424	-2.85	0.011	.2989526	.8367961	
age20_35	.7308728	.0708332	-3.23	0.005	.5951342	.8975708	
_cons	.6049733	.0625811	-4.86	0.000	.4858461	.75331	

## Predictors of Supplementation -- BMI



tookDinlast30days	Linearized					
	Odds Ratio	Std. Err.	t	P> t	[95% Conf. Interval]	
bmi25_30	.9755281	.1437848	-0.17	0.869	.7137427	1.333331
bmi30_25	.9444374	.214234	-0.25	0.804	.5838914	1.527616
bmi35up	.4953084	.1317164	-2.64	0.018	.2818679	.8703737
_cons	.5577776	.0860393	-3.78	0.002	.402203	.7735294

## Predictors of Supplementation -- Race/Ethnicity



tookDinlast30days	Linearized					[95% Conf. Interval]
	Odds Ratio	Std. Err.	t	P> t		
black_nh	.5952558	.128544	-2.40	0.029	.3766073	.940846
hispanic	.4910924	.0980331	-3.56	0.003	.3216459	.7498051
otherrace	.885824	.219212	-0.49	0.631	.5242204	1.496859
mexamerican	.3764179	.0578723	-6.36	0.000	.271721	.5214557
_cons	.5965417	.0806312	-3.82	0.002	.4479194	.7944777

## Predictors of Supplementation — Years in the US



tookDinlast30days	Linearized					
	Odds Ratio	Std. Err.	t	P> t	[95% Conf. Interval]	
usyear3_5	2.49152	1.087294	2.09	0.053	.9878456	6.284052
usyears6_9	2.020136	.9326651	1.52	0.147	.7591454	5.375716
usyears10up	2.722384	.8257396	3.30	0.005	1.431194	5.178455
_cons	.1876933	.0647368	-4.85	0.000	.0903452	.3899351

## Predictors of Supplementation -- Income



tookDinlast30days	Linearized					
	Odds Ratio	Std. Err.	t	P> t	[95% Conf. Interval]	
incomeunder25	.7536639	.1532646	-1.39	0.183	.489725	1.159853
income25to45	1.714742	.3849124	2.40	0.029	1.065455	2.759703
income65to75	1.593857	.5347174	1.39	0.184	.782671	3.245782
incomeover75	2.404324	.4114115	5.13	0.000	1.672844	3.455656
_cons	.3386964	.0416548	-8.80	0.000	.260965	.4395811

## Predictors of Supplementation — Food Security



tookDinlast30days	Linearized					
	Odds Ratio	Std. Err.	t	P> t	[95% Conf. Interval]	
marginalfoodsecure	<b>.5333549</b>	<b>.1575193</b>	<b>-2.13</b>	<b>0.049</b>	<b>.2851745</b>	<b>.9975208</b>
lowfoodsecure	<b>.3973535</b>	<b>.0648144</b>	<b>-5.66</b>	<b>0.000</b>	<b>.2811919</b>	<b>.561502</b>
verylowfoodsecure	<b>.3957843</b>	<b>.1068818</b>	<b>-3.43</b>	<b>0.003</b>	<b>.2232713</b>	<b>.7015914</b>
_cons	<b>.5808102</b>	<b>.0689079</b>	<b>-4.58</b>	<b>0.000</b>	<b>.451654</b>	<b>.7469003</b>

# Strengths

- Detailed demographics
- Groundwork for 09-10 data
- Angles of vitamin D supplementation (duration, dose, intake/not)
- Broad, representative sample

# Limitations

- Recall/Epidemiology
- Date/season of collection
- Limited race/ethnicity data
- Could not measure serum status
- Sun exposure
- Some statistical power
- Few pregnant women



# Implications for public health and future research



- Who is getting vitamin D supplementation message? Disparities
- May enhance existing disparities
- Advocacy
- Practice
- Messaging/media
- Study of 2009-2010 NHANES data
- Study of pregnant/breastfeeding women in more detail with new data

# Acknowledgements



## Thesis Committee

- Janice Bell PhD, MPH, MN, BScN (Chair)
- Mario Kratz, PhD, MSc
- Daniel Enquobahrie, PhD, MPH, MD



And all my patient and caring friends and family members for hearing me talk about this constantly and sending me pictures of kittens for encouragement.