



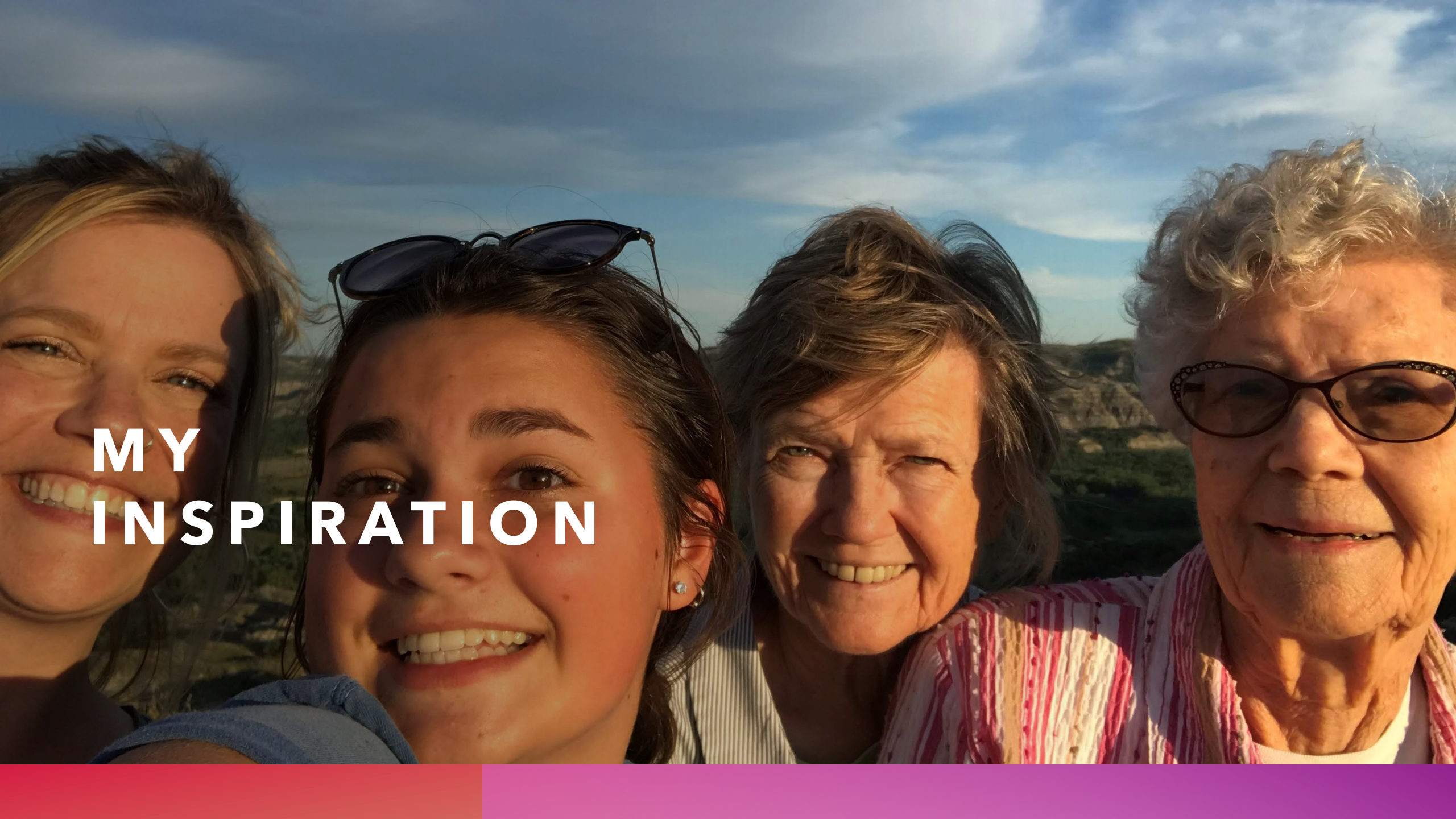
HELPING LONG-TERM CARE RESIDENTS KEEP THEIR SHINE

Beth Sanford, DNP, RN, ACN, CLC, PHN

PURPOSE

The purpose of this presentation is to highlight how to keep nursing home residents (and staff!) healthy and happy by moving current vitamin D science into practice.





**MY
INSPIRATION**

VITAMIN D IS

- a hormone
- a vitamin/nutrient
- a cell-signaling molecule

Functions include

- Communicating between cells
- Regulating of the immune system
- Preventing tumor growth
- Regulating gene expression
- Decreasing inflammation
- Insulin regulation
- Maintaining endothelial integrity
- And so much more...

“Vitamin D has multiple overlapping mechanisms developed evolutionarily and designed to protect humans from internal (metabolic and oxidative abnormalities) and external (environmental and pathogens) harm. Its canonical actions work via **modulating and repairing genomic DNA.**

However, vitamin D also has critical non-genomic activities, like acting on membranes and intracrine/autocrine and paracrine signaling mechanisms. These non-transcriptional mechanisms are essential in **controlling inflammation, preventing endothelial and epithelial cell destabilization, and keeping humans healthy.**”

~ *Dr. Sunil Wimalawansa*

The Body Needs All Forms of Vitamin D

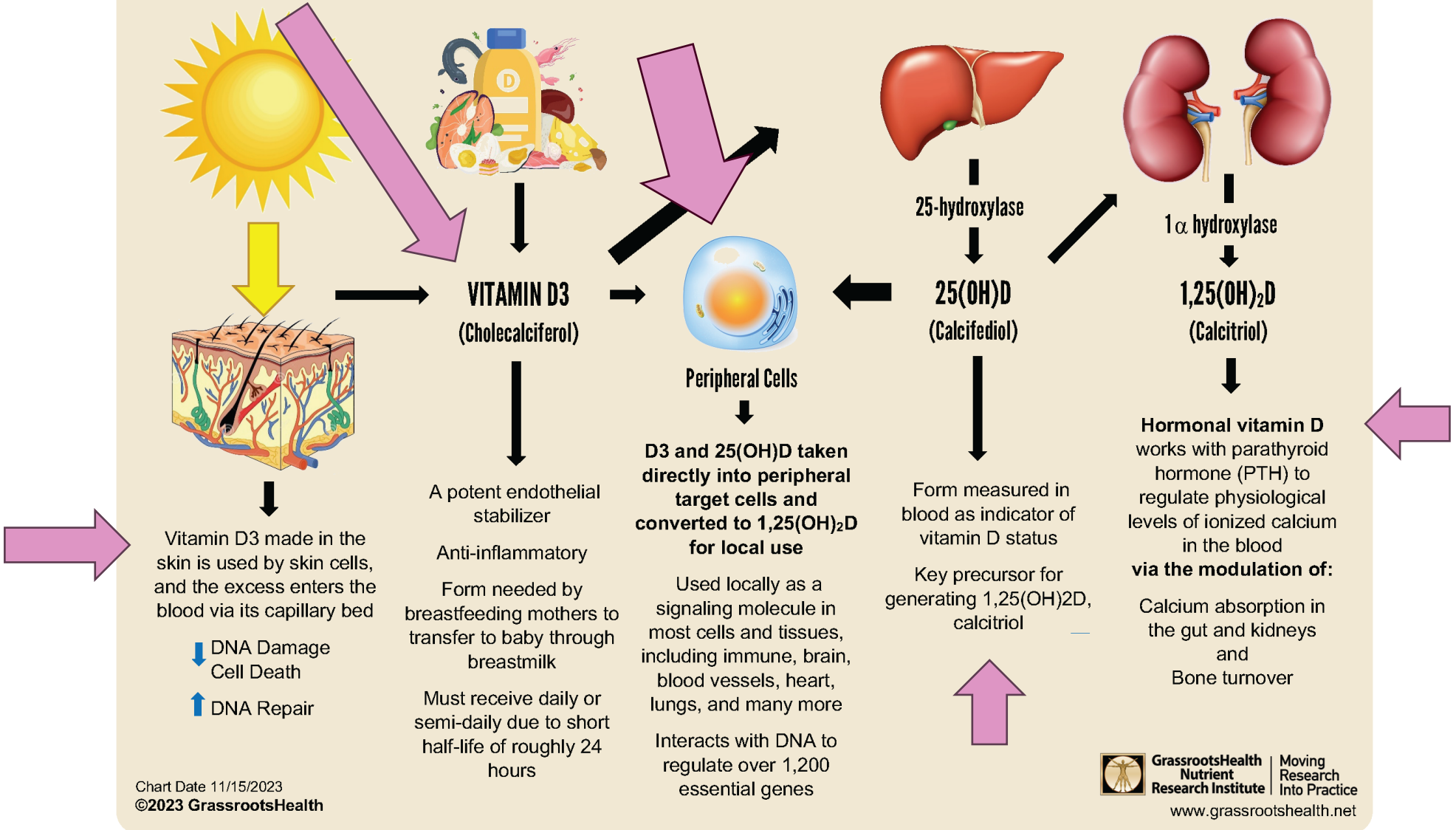


Chart Date 11/15/2023
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Moving Research Into Practice
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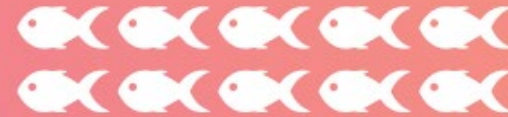
50



glasses of milk

OR

10

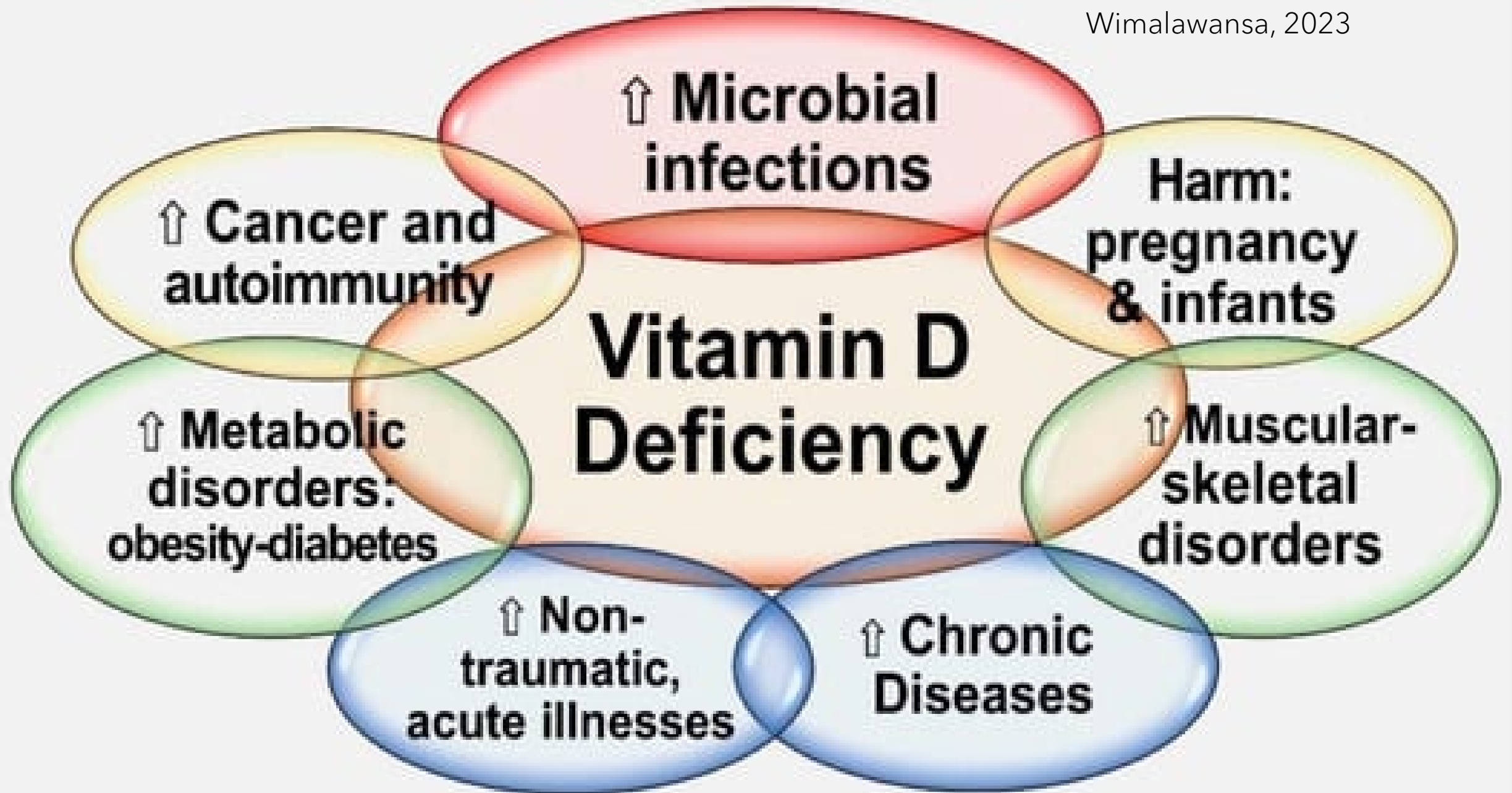


pieces of salmon

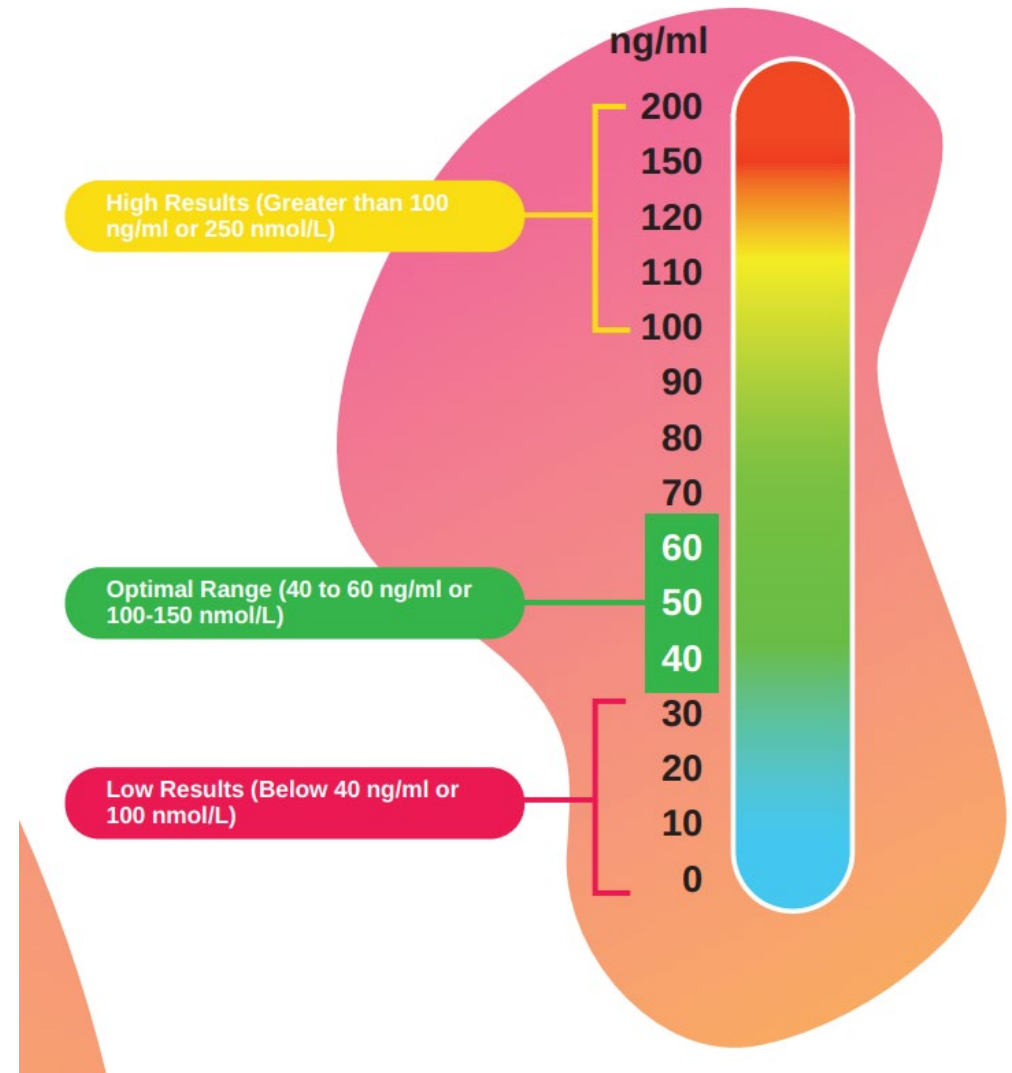
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5000 IU

from a supplement source



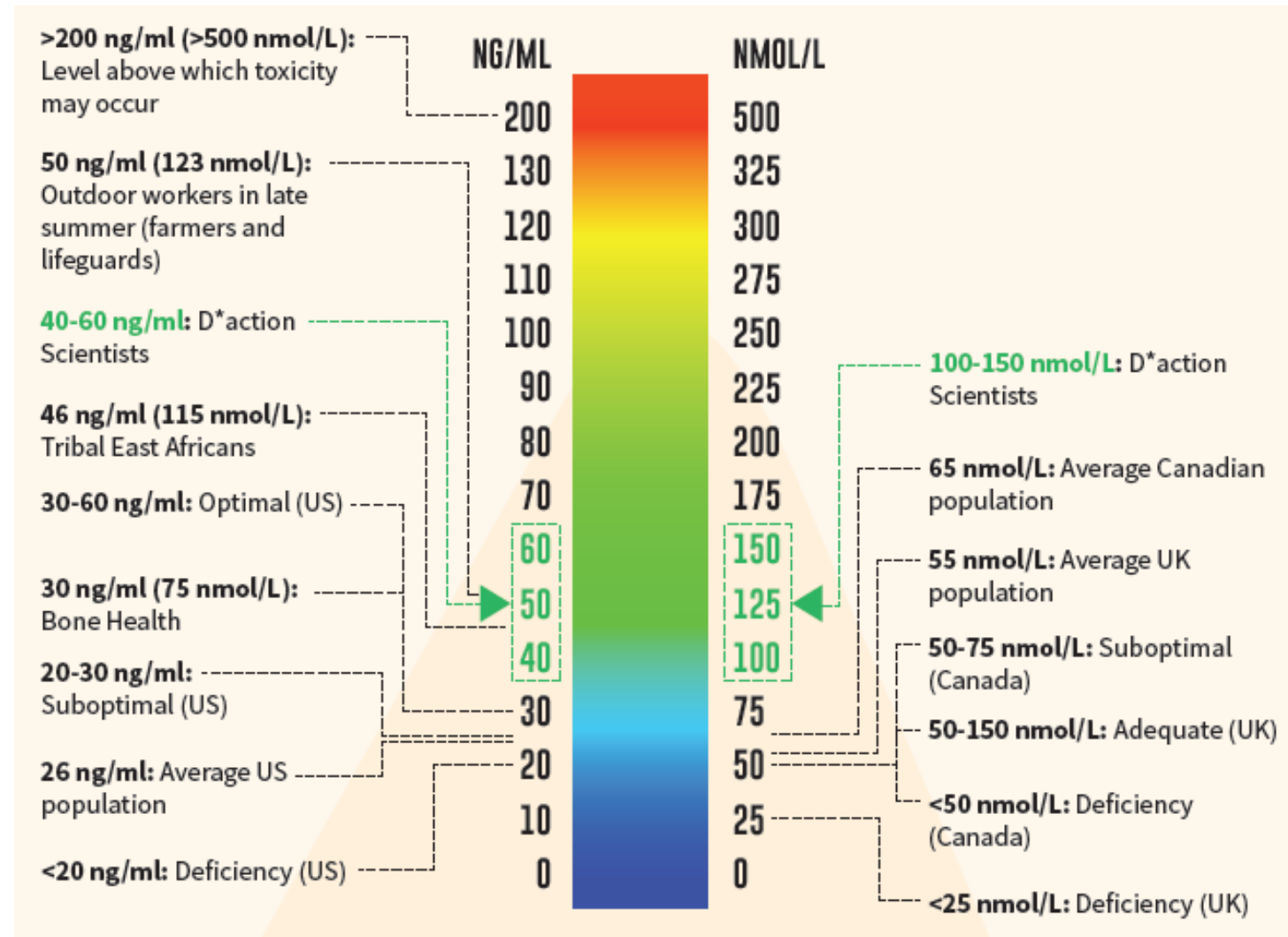
OPTIMAL 25(OH)D SERUM CONCENTRATIONS



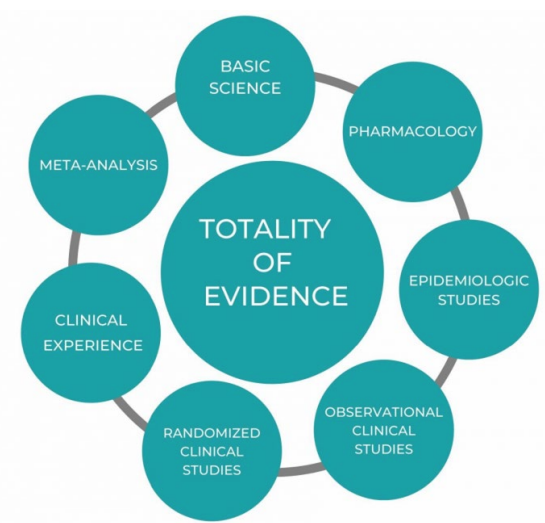
OPTIMAL 25(OH)D SERUM CONCENTRATIONS

Compare average levels of 46 ng/ml (100 nmol/L) among East African tribes to the averages of these developed nations:

- US average: 26 ng/ml (65 nmol/L)
- Canadian average: 26 ng/ml (65 nmol/L)
- UK average: 22 ng/ml (55 nmol/L)



TOTALITY OF EVIDENCE



Traditional Lifestyle



Lifeguards



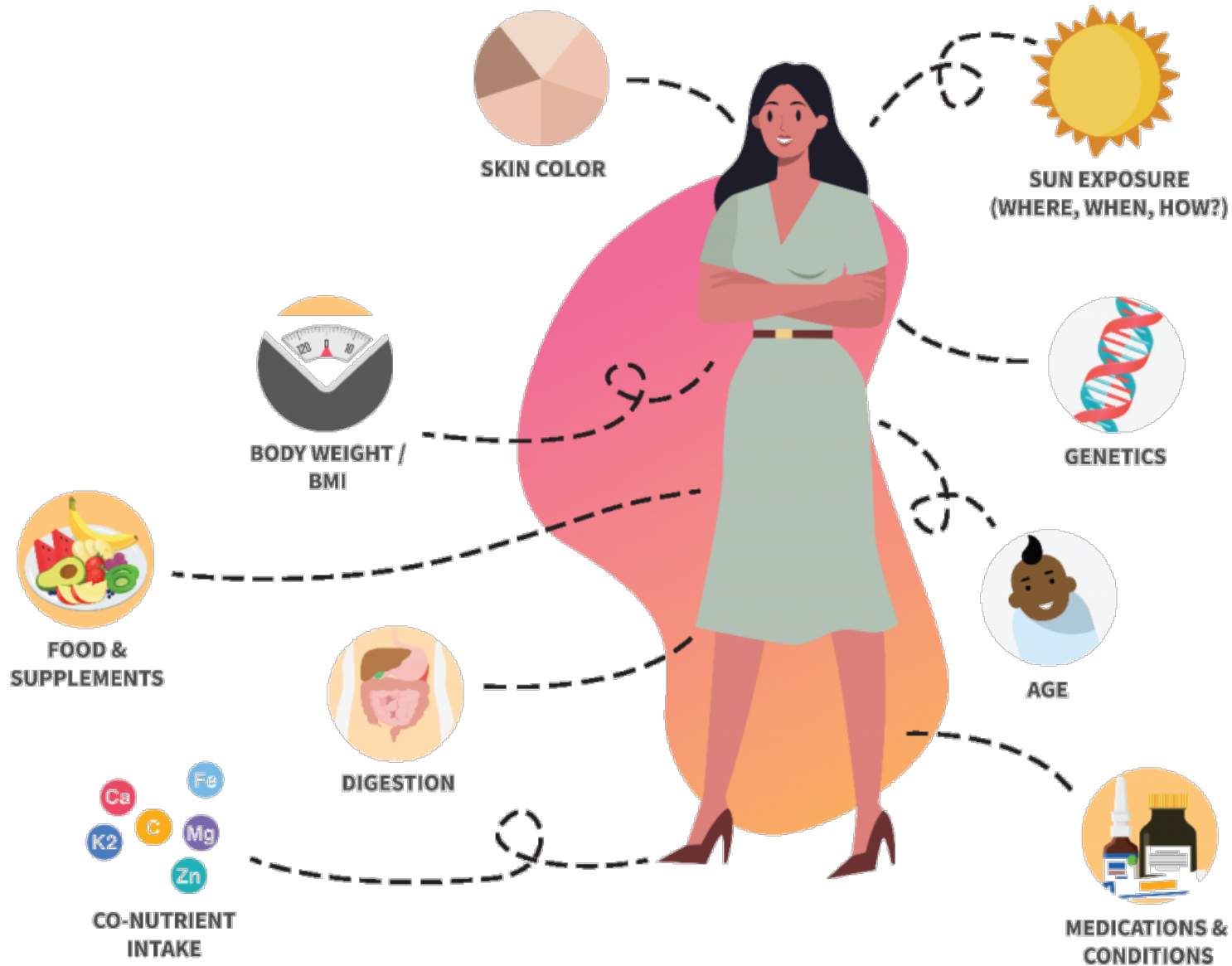
Lactating Women





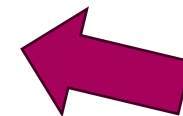
DETERMINANTS OF HEALTH

- Environmental determinants of health pose a significant risk for vitamin D deficiency and insufficiency in North Dakota (ND) such as latitude (48 degrees N), where vitamin D-generating ultraviolet B (UVB) rays do not reach the state from October to April due to solar zenith, and inclement weather drives the population indoors (Sanford et. al, 2023).



INDIVIDUAL RISK FACTORS

- Medication use, age, co-nutrient intake, digestive health, body weight, occupation, lifestyle choices, skin color, and cultural habits, leading to decreased sun exposure during peak UV index hours (10-2 pm) or covering of the body for personal or religious reasons may be additional individual risk factors for healthcare providers to consider (Sanford et al., 2023).



Wakeman (2021) Potential Impact of Medication on Vitamin D Status

The Fitzpatrick Scale



BLACK/AA INDIVIDUALS AT INCREASED RISK FOR HEALTH DISPARITIES R/T VITAMIN D DEFICIENCY/INSUFFICIENCY

- Individuals of B/AA race/ethnicities are at increased risk for health disparities related to VDD vs. their Caucasian counterparts due to darker skin tone, requiring increased time in the sun to manufacture similar amounts of vitamin D (Ames et al., 2021; Englesen, 2010).
- NHANES Data show 68% of Black/AA women have vitamin D concentrations <20 ng/ml, with 80% of Black/AA having vitamin D Levels below 30 ng/ml (75 nmol/L); 95% below the scientific recommendation of 40 ng/ml (100 nmol/L) (GrassrootsHealth, 2022)
- Australia is the first country in the world to have sun exposure recommendations based on skin tone.

SPECIAL POPULATION RISK FACTOR



Nursing home residents are at increased risk for vitamin D deficiency/insufficiency (VDD/I) due to:

- decreased independence and mobility to take themselves outdoors,
- natural changes in the skin and digestive system related to aging, and
- typically, the use of multiple medications, which impact vitamin D serum concentrations.

ADDRESSING CONCERNS

Daily dosing (or at most, weekly) vs. monthly

[When Taking Vitamin D Can be Ineffective and Possibly Harmful - GrassrootsHealth](#)

Toxicity

- 200 ng/mL
- 10,000 IU/day GRAS
- McCullough et al.

Kidney Stones

- Not associated
- VDD is a risk factor for kidney stones

Research

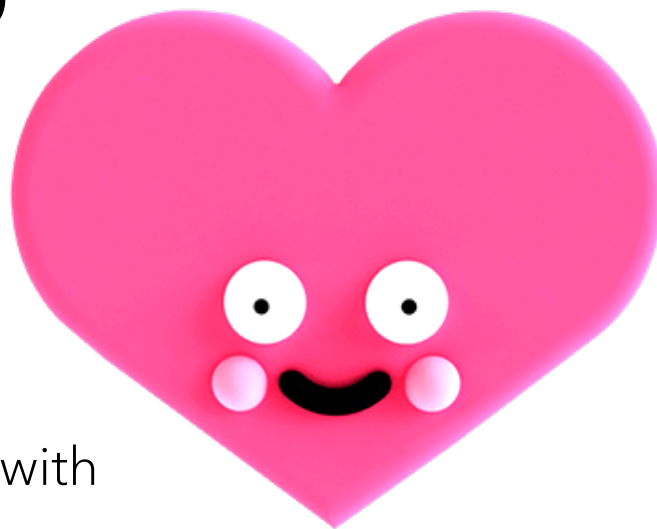
- Poorly designed studies causing confusion
- Heaney criteria of nutrient study design (2014)
- Pre-post 25(OH)D serum concentrations with metrics



**GrassrootsHealth
Nutrient
Research Institute**

**Moving
Research
Into Practice**

VITAMIN D & BREAST CANCER



83% lower Breast Cancer risk with a Vitamin D level of 60 vs. 20 ng/mL

Lowers risk and increases survival!

See GRH Breast Cancer Infographic for more details and studies

GrassrootsHealth | Moving Research Into Practice

VITAMIN D & BREAST CANCER
REDUCE RISK, IMPROVE OUTCOMES

Research shows...

While BREAST CANCER afflicts over 268,000 American women each year and kills over 41,000 (cancer.org), it is also among the 2nd or 3rd MOST READILY PREVENTABLE CANCERS.

What Can Vitamin D do to Help Prevent Breast Cancer?

- 83% Lower Breast Cancer Risk with a Vitamin D Level of 60 vs. 20 ng/ml
- 69% Lower Breast Cancer Risk with a D Level of 30 vs. 12 ng/ml
- 82% Lower Breast Cancer Risk with a D Level of 60 vs. 20 ng/ml
- 71% Lower Breast Cancer Risk with a D Level of 60 vs. 20 ng/ml

Lowe et al. (2005), Abbas et al. (2007), McDonnell et al. (2018), Song et al. (2019)

Approximately 75% OF BREAST CANCER (adenocarcinoma) could be due to vitamin D deficiency, and therefore easily prevented.

What Can Vitamin D do if You Currently Have Breast Cancer?

D Level at Time of Diagnosis was related to

- 27% Lower Risk of Breast Cancer Death
- 21% Lower Risk of Recurrence-Free Death
- 18% Lower Risk of Invasive Disease-Free Death

with Vitamin D Levels of 30 ng/ml vs. 20 ng/ml or Lower

Vitamin D Initiated within 6 Months of Diagnosis was related to a 49% Lower Risk of Breast Cancer Death

Among Women Already Diagnosed, there was a 44% Lower Risk of Breast Cancer Related Death with D Levels of 30 ng/ml vs. 17 ng/ml...

Yao et al. (2021), Madden et al. (2018), Mohr et al. (2014)

...IN FACT, the vitamin D level accounted for 97% of the variance in breast cancer fatality, meaning IT MADE ALMOST ALL THE DIFFERENCE!

It is Not Too Late to Start with Vitamin D

Take Action Today! Reduce your risk and improve outcomes.

- Test your vitamin D level
- Make changes to reach at least 40-60 ng/ml (100-150 nmol/L)
- Re-test to see how your level responded - repeat until your level is where it needs to be

~90% US Adults HAVE VITAMIN D LEVELS BELOW 40-60 NG/ML

Get 10% OFF your first home test kit with code **FirstTest10** at grassrootshealth.net/test

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FALLS

- A low level of serum vitamin D is an independent predictor of incident falls (Flicker et al., 2003)
- Treatment with **daily** dose vitamin D3 (>800 IU supplementation) could decrease incidences of falls, RR=0.884 (95% CI 0.830 - 0.943; $P<.001$) (Thanapuetiwong et al., 2020)
- Only cholecalciferol (vitamin D3) seemed to show significant benefit, RR=0.945 (95% CI 0.903-0.988; $P=.01$).
- Monthly high doses are associated with INCREASED fall risk.

28-DAY MORTALITY RATES AMONG ICU PATIENTS

28-Day Mortality Rates Among ICU Patients Grouped by Vitamin D Status at Admission

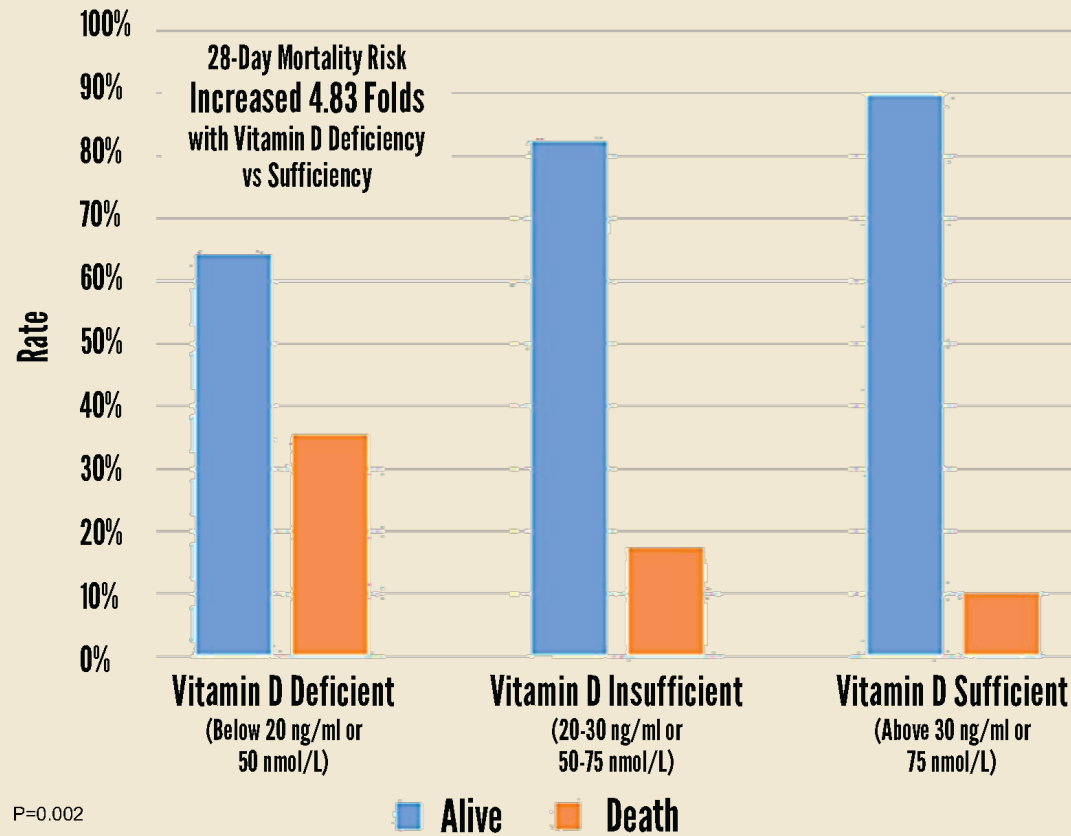


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Sistanian et al., *BMC Nutrition*, 2024.

SISTANIAN ET AL, 2024

- N= 236 intensive care unit (ICU) patients, seven ICUs in 3 different hospitals
- Looking at the association between vitamin D status, clinical outcomes, and mortality. The average age of patients was 45 years old.
- Vitamin D levels were drawn within the first 24 hours of admission.
- **69% of patients were vitamin D deficient (with vitamin D levels below 20 ng/ml or 50 nmol/L) upon admission.**

HAI QURAISHI ET AL. 2014,

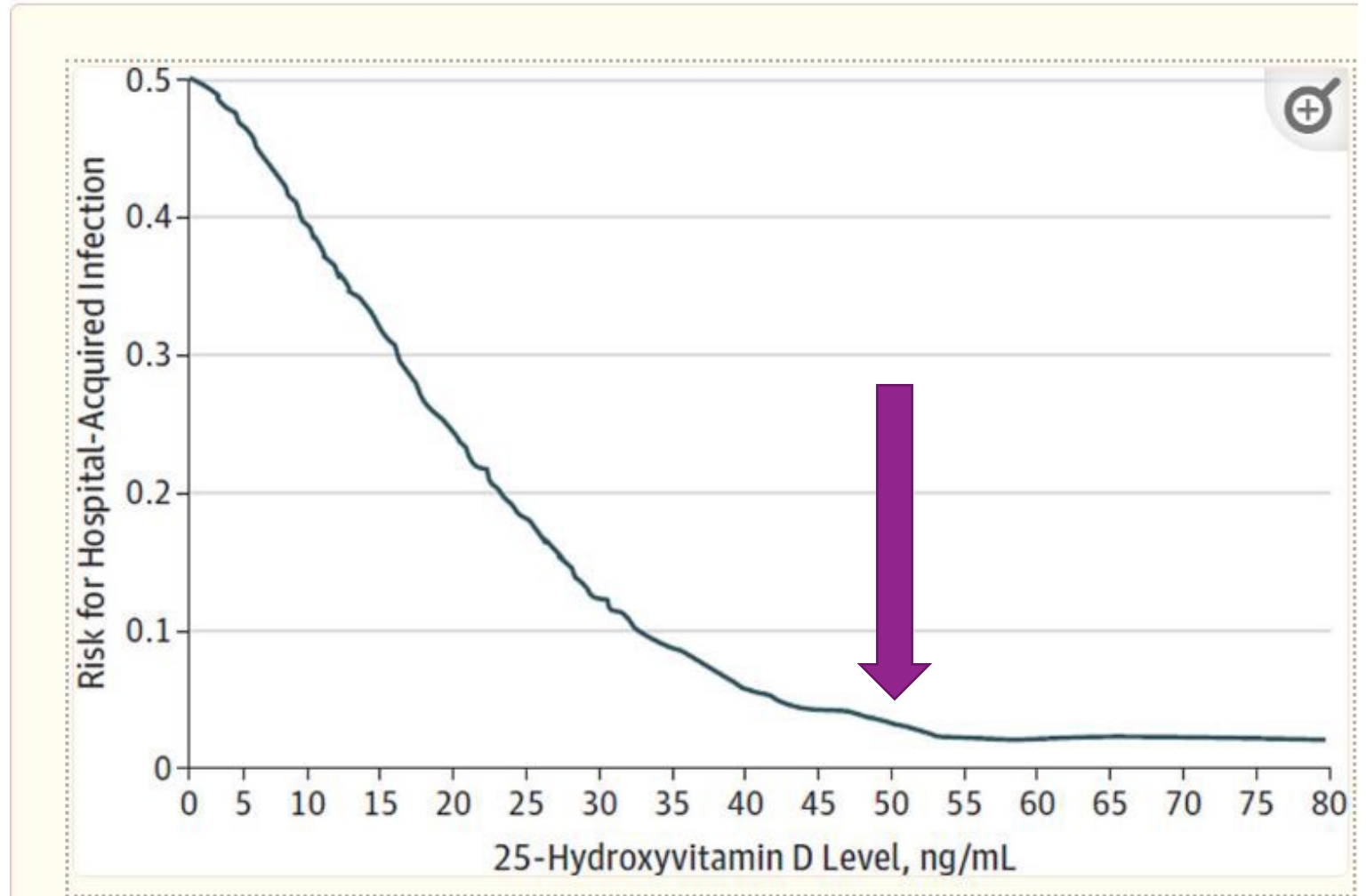
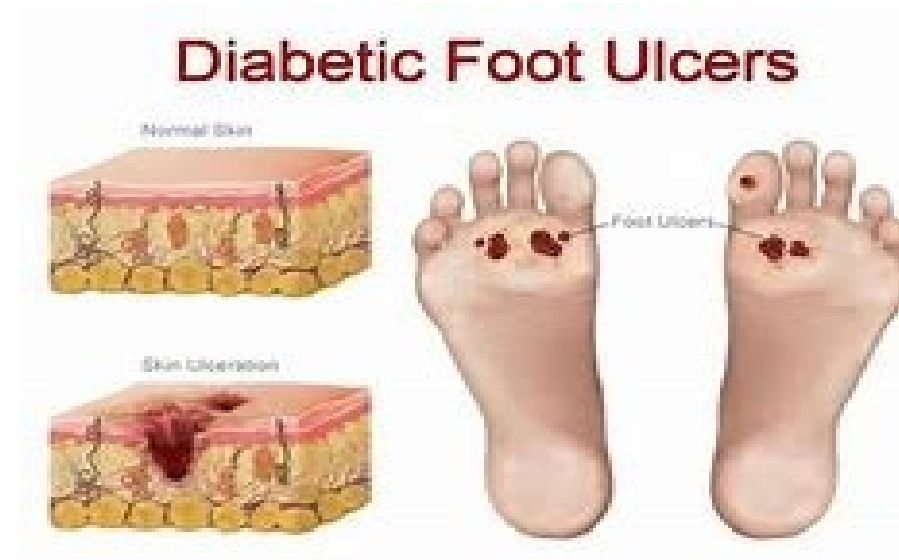


Figure 1

Vitamin D Status vs Risk for Hospital-Acquired Infections

SKIN BREAKDOWN PREVENTION AND HEALING

Preliminary results from a current QI project in North Dakota show rapid wound healing (surgical wounds, and diabetic and pressure ulcers) in participants who achieved 50 ng/mL using the GrassrootsHealth vitamin D*calculator and daily vitamin D3 supplementation



INFECTION RESILIENCE-- CAUTI

PRELIMINARY RESULTS FROM A
CURRENT QI PROJECT IN NORTH
DAKOTA SHOW DECREASED
CAUTI IN PARTICIPANTS WHO
ACHIEVED 50 NG/ML USING THE
GRASSROOTSHEALTH VITAMIN
D*CALCULATOR AND DAILY
VITAMIN D3 SUPPLEMENTATION

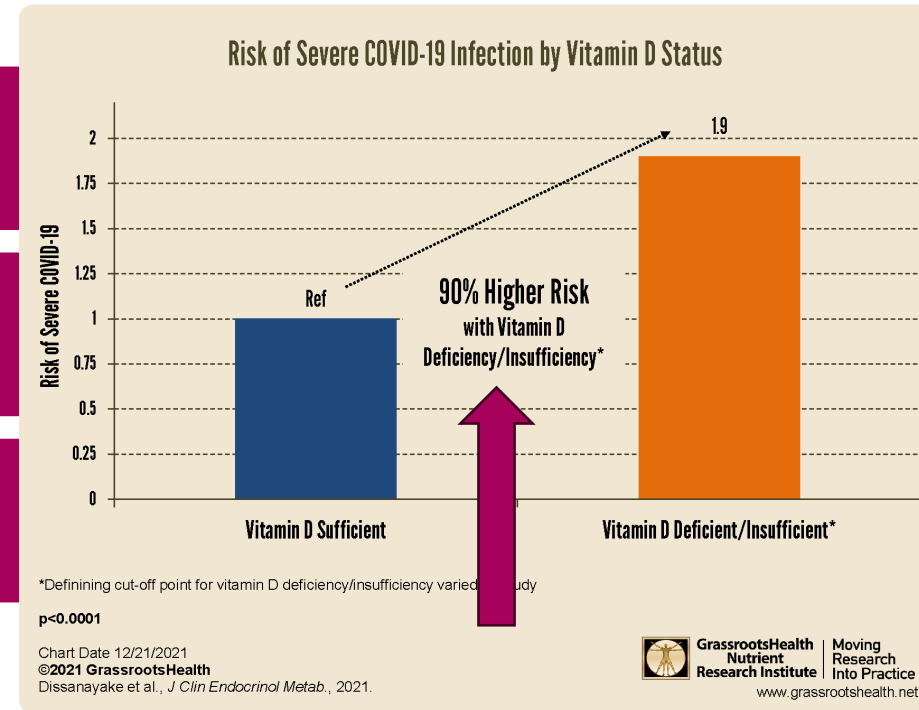


Risk of infection 46% higher

Risk of severe infection 90% higher

Risk of Death 107% higher risk

Dissanayake et al. 2021



2
2

**COVID-19 PREVENTION, SEVERE
INFECTION & DEATH RISK**

WIMALAWANSA, 2022–COVID-19 DEATHS

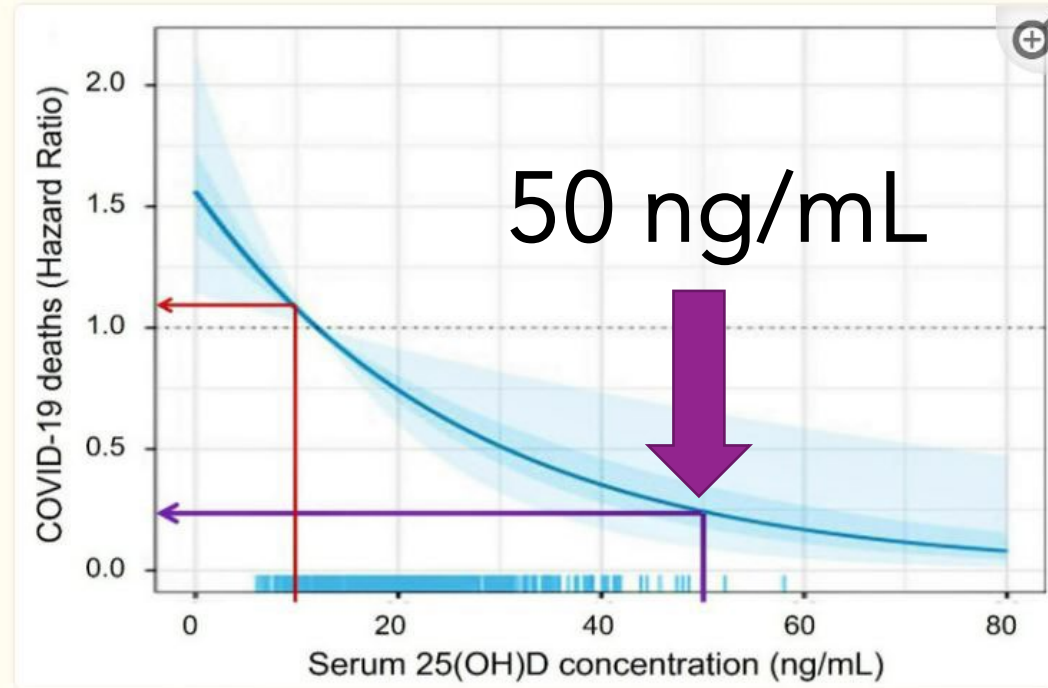


Figure 3

Post-estimation simulation of 25(OH)D concentrations using 15 and 50 ng/mL as the cut-offs predict more than four-fold higher mortality from COVID-19. Data adjusted for age, sex, BMI, C-reactive protein, D-dimer, oxygen saturation, and chronic diseases, such as type 2 diabetes and chronic kidney disease (modified after Vanegas-Cedillo, P. et al., 2022) [55].



COGNITIVE & MENTAL HEALTH (RESIDENTS & STAFF)

MARCH 11-17 BRAIN WEEK

VITAMIN D FUNCTIONS IN THE BRAIN AND NERVOUS SYSTEM TO:

- Stimulate neural cell growth and maturation during brain development
- Protect neural cells from damage due to oxidative stress and inflammation
- Play a role in the production of neurotransmitters (dopamine, serotonin, acetylcholine, catecholamine)
- Modulate the "stress" HPA axis (hypothalamus-pituitary-adrenal)
- Prevent a state of sympathetic dominance

Mental Health and Neurodegenerative Diseases associated with low vitamin D include:

- Alzheimer's Disease & Dementia
- Cognitive decline
- Parkinson's disease
- Depression/Anxiety/Seasonal Affective Disorder
- Schizophrenia
- Autism & ADHD
- Migraines
- Multiple sclerosis
- Impulsive & Addictive Behaviors
- Sleep Disorders
- Suicide

VDD AND BRAIN/ MENTAL HEALTH

Vitamin D deficiency is a modifiable risk factor for brain/mental health conditions and patient outcomes.

NUTRIENTS TO SUPPORT COGNITION, FOCUS & ATTENTION FOR ALL AGES
Research shows...

Omega-3s (DHA & EPA)
CHILDREN given 1000-2000 mg/day of DHA showed improvement in cognitive and behavioral symptoms of ADHD. Rodriguez et al. (2019)
Higher blood levels of DHA had a significant, positive effect on attention performance and executive function in TEENAGERS; those with the highest DHA scored better for attentiveness, reaction time, and executive conflict response. Pinar-Mandi et al. (2022)
For older ADULTS assessed for cognitive orientation, memory, attention, and language; those with the highest Omega-3 Index levels had a 44% lower risk of impairment compared to those with the lowest levels. Lukaschek et al. (2016)

Vitamin D
has been biologically linked to emotional well-being, cognition, and better mental health overall.
-90% US Adults have vitamin D levels below the recommended level for health.

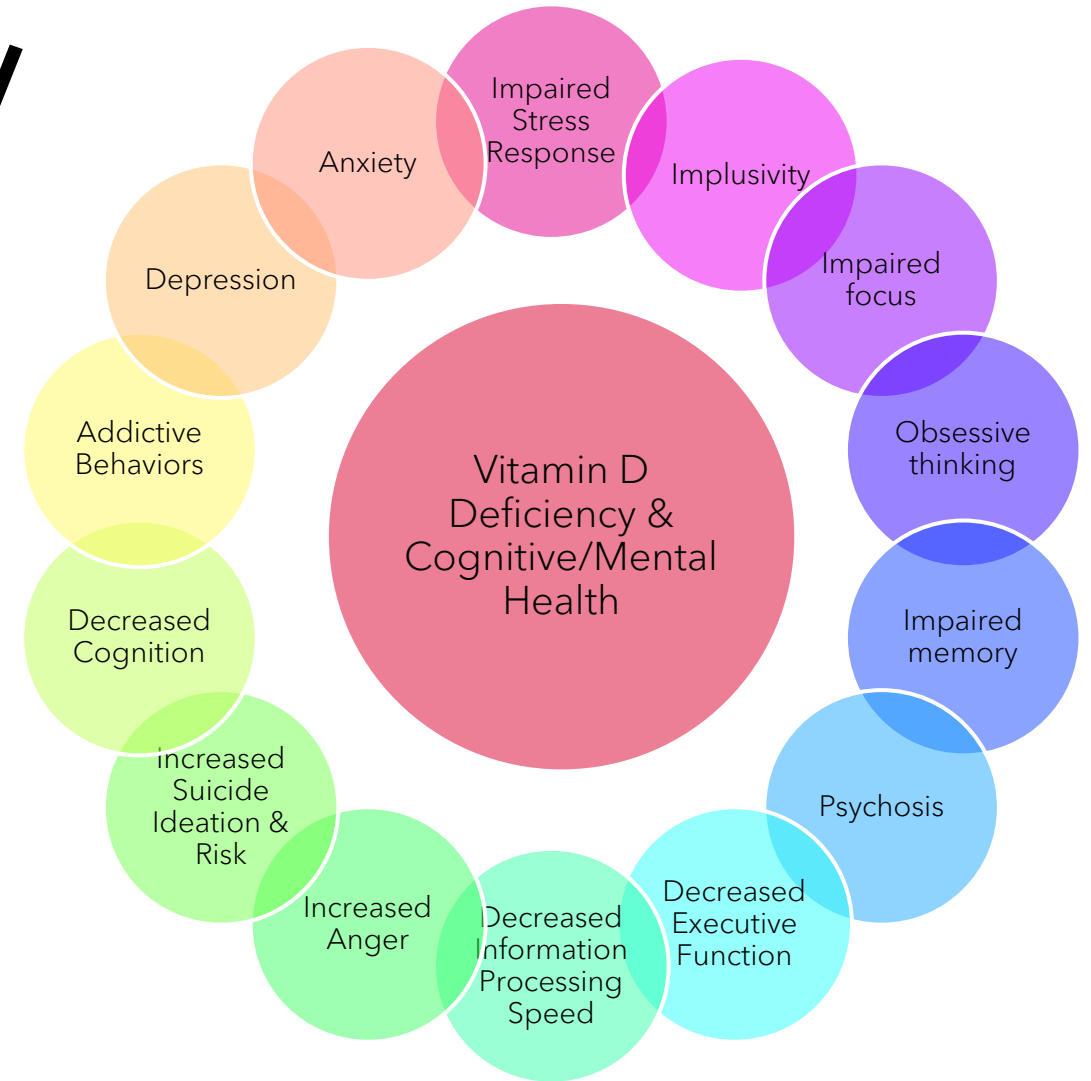
Vit D & Omega-3s
have been shown to improve irritability and hyperactivity among children with autism. Muzhary et al. (2019)

Vit D & Magnesium
Older adults getting the most magnesium and/or having the highest vitamin D blood levels scored significantly higher on cognitive function tests assessing executive function and processing speed. Peeri et al. (2020)

Vitamin C
1000 mg/day was shown to improve attention, work absorption and engagement, reaction times, fatigue, vigor, and self-control... WDW! Sim et al. (2022)

Are You Getting Enough?
Build your at-home blood spot test kit to measure levels of several of these focus-boosting nutrients!

Get 10% OFF your first test kit with code FirstTest10 at grassroothealth.net/test



YOUR BRAIN NEEDS VITAMIN D

Vitamin D Concentrations within Brain Tissue Significantly Related to Cognitive Health (Shea et al., 2022)

- Examined concentrations of vitamin D and its metabolites in the brains of 290 deceased individuals, all of whom had previously participated in a study tracking risk factors for Alzheimer's Disease and cognitive decline. The goal was to determine if there was an association between cognitive function prior to death and vitamin D levels found in the brain tissue.
- The main form of vitamin D measured in brain tissue was 25(OH)D₃, with higher concentrations associated with a 25-33% significantly lower risk of dying with dementia or mild cognitive impairment.
- Higher vitamin D levels in the brain were also related to better global cognitive function scores, a slower rate of cognitive decline, and better semantic and working memory before death.

BRAIN VITAMIN D FORMS, COGNITIVE DECLINE, AND NEUROPATHOLOGY IN COMMUNITY-DWELLING OLDER ADULTS

SHEA ET AL. 2022

Vitamin D and its metabolites in the brains of 290 deceased individuals

Participants in the Rush Memory and Aging Project, a study tracking risk factors for Alzheimer's Disease and cognitive decline

The goal was to determine if there was an association between cognitive function prior to death and vitamin D levels found in the brain tissue.

- The researchers discovered that the main form of vitamin D measured in brain tissue was 25(OH)D3.
- **Higher concentrations of 25(OH)D3 associated with a 25-33% significantly lower risk of dying with dementia or mild cognitive impairment.**
- Higher vitamin D levels in the brain were also related to:
 - **better global cognitive function scores,**
 - **a slower rate of cognitive decline, and**
 - **better semantic and working memory before death.**

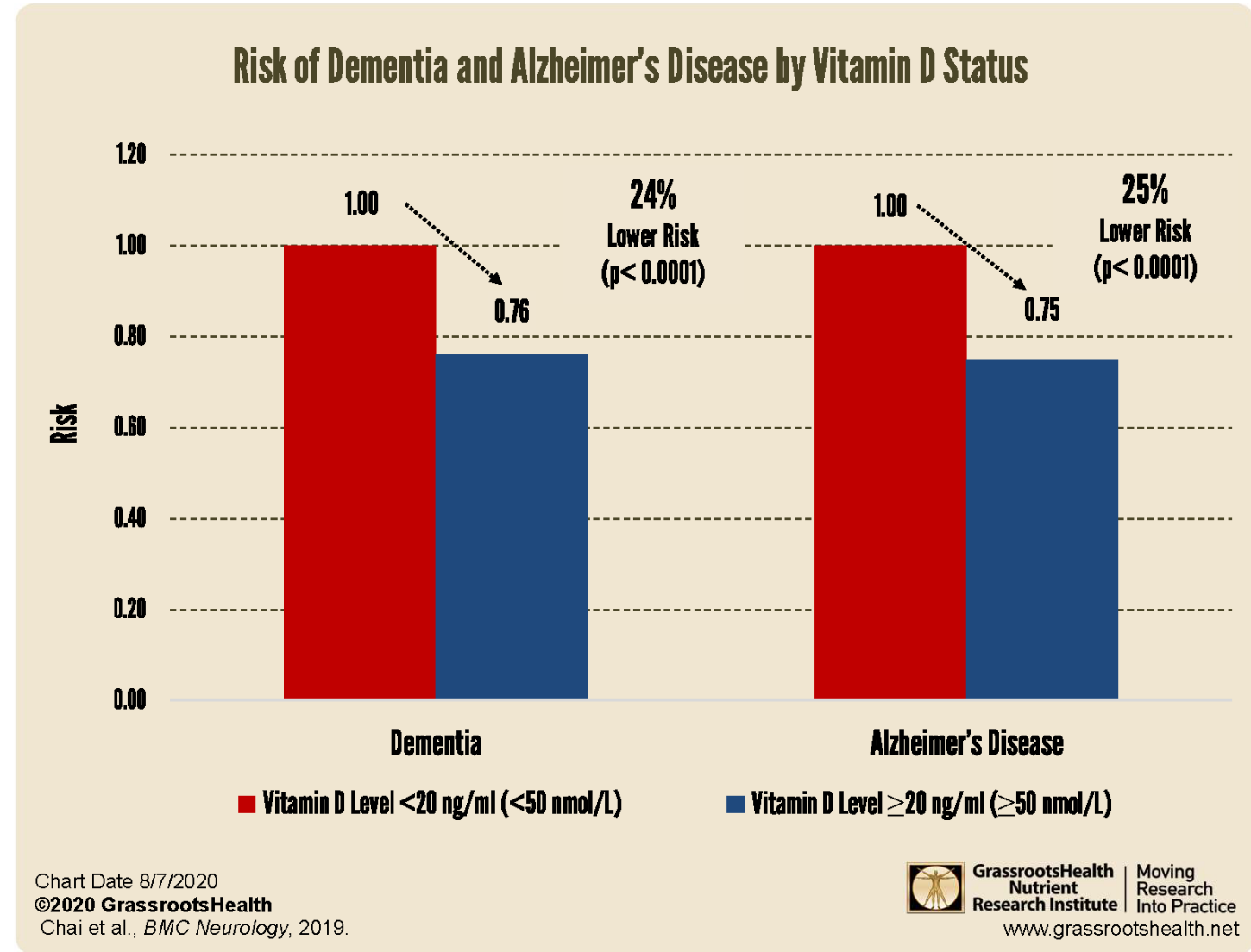
VITAMIN D, DEMENTIA & ALZHEIMER'S DISEASE

1 in 3 seniors dies with some form of dementia, and between the years 2000 and 2018, deaths due to Alzheimer's increased by 146%

Research on the impact of vitamin D on patient outcomes related to dementia and Alzheimer's Disease has seen consistent results since 2010.

Chai et al. (2019) found a 25% Risk Reduction of Alzheimer's Disease and Dementia for levels above 20ng/ml

Double the risk of all-cause dementia and almost triple the risk of Alzheimer's specifically among those with vitamin D levels < 20 ng/ml (Feart et. al, 2017)



VITAMIN D AND MENTAL HEALTH

Groves et al. (2014)

This chart beautifully illustrates the strength of evidence of the association between vitamin D and different brain disorders.

Many other studies on vitamin D and these disorders have been published since the creation of this chart.

Strength of Evidence of the Association between Vitamin D and Different Brain Disorders (2014)

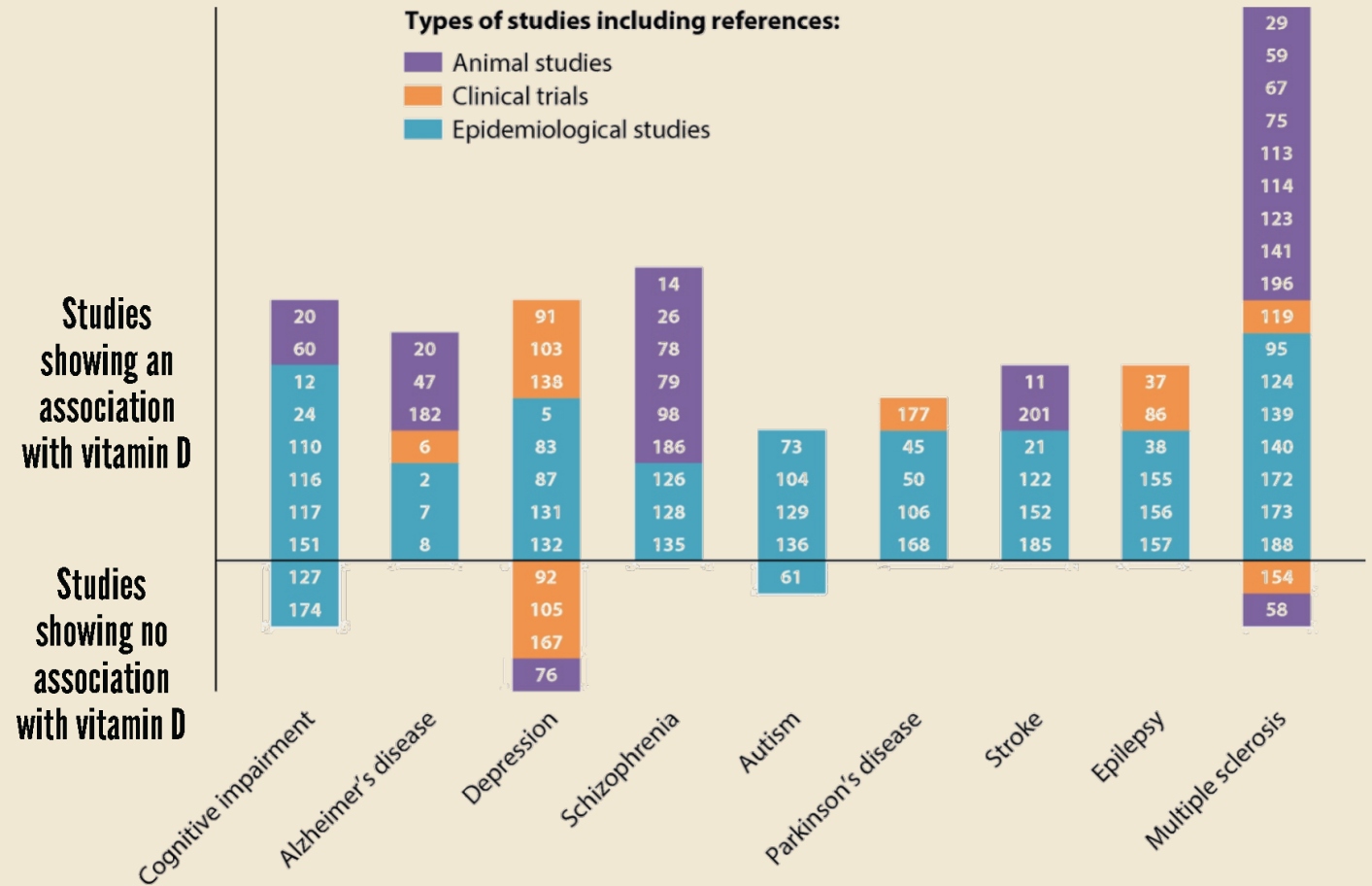


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Groves et al., *Annu. Rev. Nutr.*, 2014.



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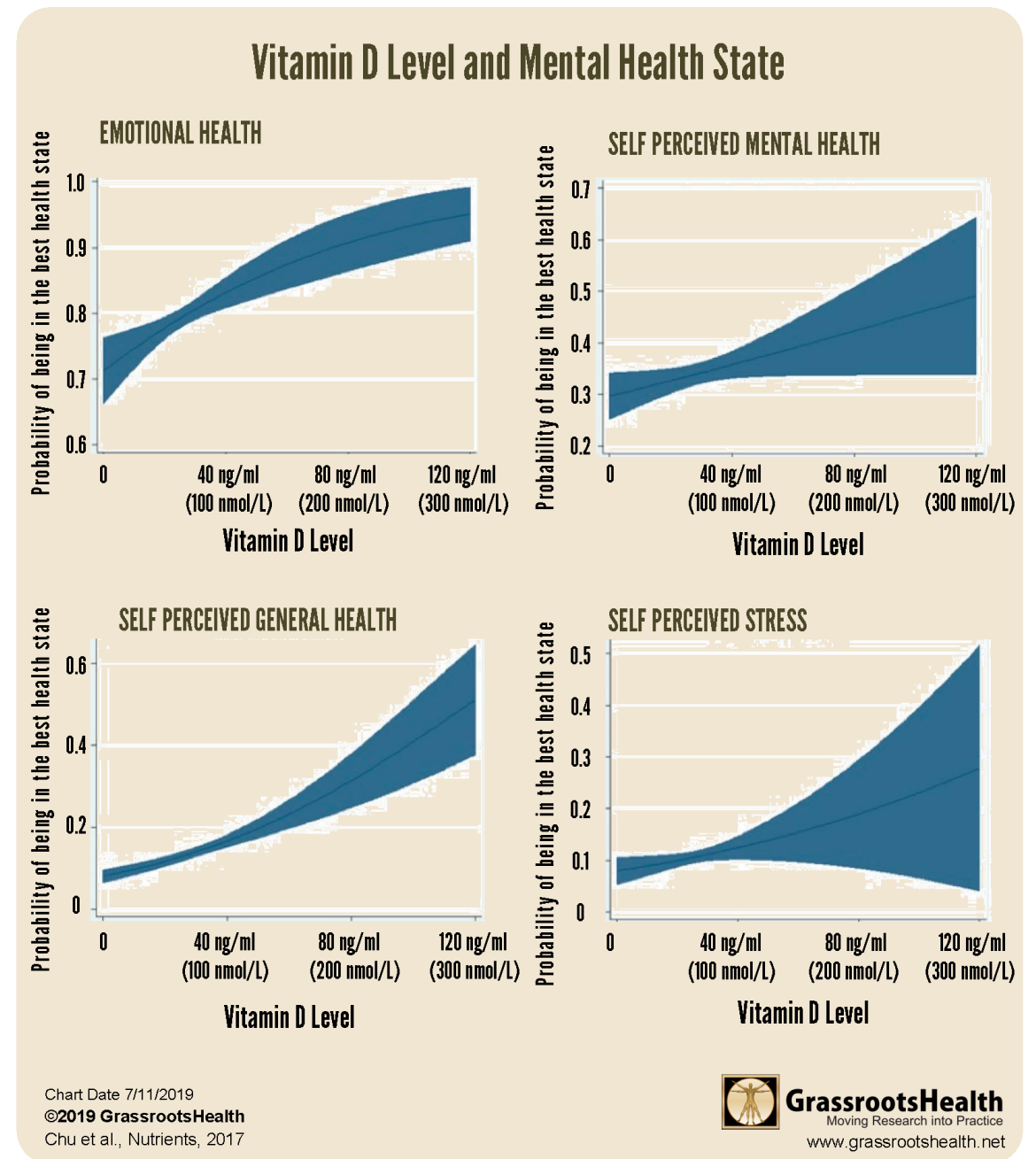
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VITAMIN D AND MENTAL HEALTH

Vitamin D has been biologically linked to emotional well-being, mood, cognition, and better mental health overall.

A study by Chu et al. on vitamin D and mental health found that **self-perceived** measurements of mental and emotional wellness were positively associated with higher vitamin D levels.



VITAMIN D AND BEHAVIORAL DISORDERS IN OLDER ADULTS: RESULTS FROM THE CLIP STUDY (GILBERT ET AL., 2024)

Setting: Geriatric acute care unit in a tertiary university hospital in France for three months at the end of winter and beginning of spring.

Participants: 272 patients 65 years consecutively hospitalized or seen in consultation.

- Vitamin D deficiency was inversely associated with the subscore of agitation and aggressiveness ($p=0.005$)
 - **Conclusion: Vitamin D deficiency was associated with more severe subscores of agitation and aggressiveness and of disinhibition among older adults.**
 - This provides a scientific basis to test the efficacy of vitamin D supplementation on behavioral disorders in older patients with vitamin D deficiency.
- *very low 25(OH)D concentrations of participants: serum 25(OH)D average was 20 ng/mL
- ≤ 10 ng/mL or >10 ng/mL

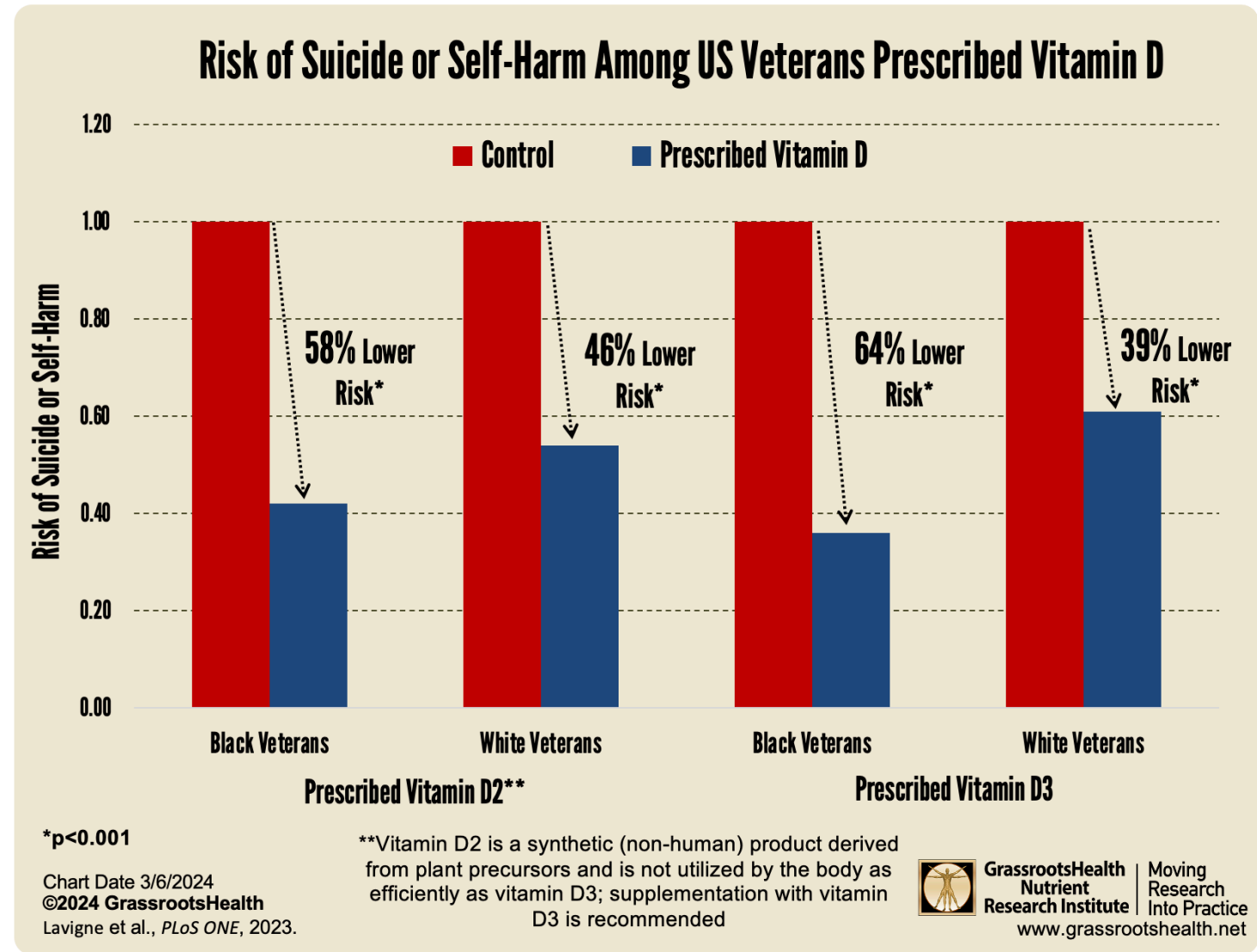
VITAMIN D, SUICIDE & SELF-HARM

30-50% of veterans and service members have vitamin D levels below 20 ng/ml (50 nmol/L)

A 2023 study among US Veterans found that vitamin D supplementation was associated with a 45-48% lower risk of suicide attempt and self-harm

The higher the dose of vitamin D, the greater the risk reduction, with a greater risk reduction found among Black veterans compared to White veterans

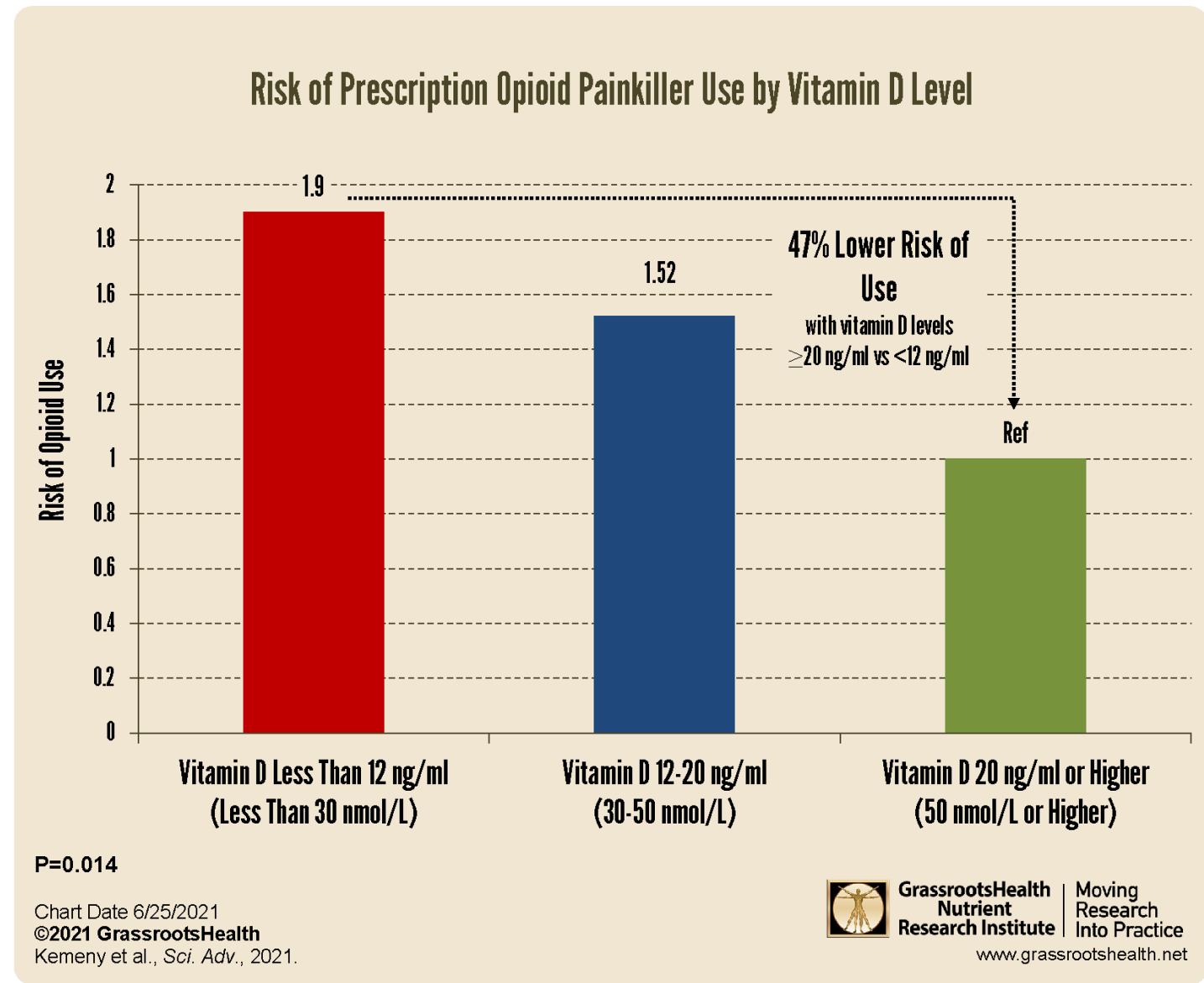
Analysis by baseline vitamin D level found a 64.1% reduced risk among those with a starting vitamin D level between 0-19 ng/ml who were then prescribed vitamin D3 compared to those who were not prescribed vitamin D3; each additional percentage point increase in average daily dose of vitamin D3 among this group was associated with a 13.8% reduction in risk, showing a dose-dependent relationship



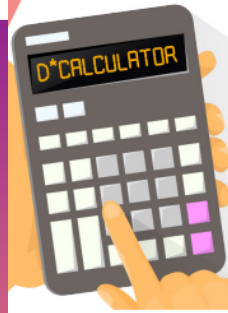
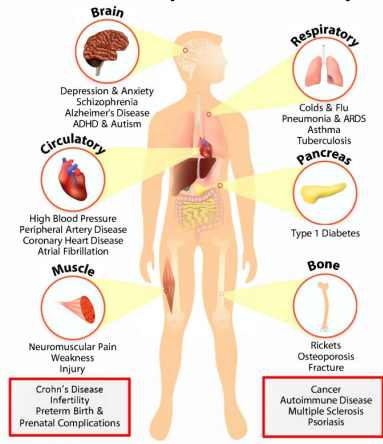
OPIOID ADDICTION AND VITAMIN D DEFICIENCY

Kemeny et al. (2021)

- Data from the National Health and Nutrition Examination Survey (NHANES, 2003-2004) was used to group individuals by vitamin D level and compare vitamin D levels to opioid use
- Found an inverse, dose-dependent association between vitamin D levels and self-reported opioid use, independent of pain
- Decreased frequency of opioid use among individuals with higher vitamin D levels; a 47% lower risk of opioid use among those with a vitamin D level of 20 ng/ml (50 nmol/L) or higher compared to those with levels below 12 ng/ml (30 nmol/L)



VITAMIN D DEFICIENCY Affects Every Part of the Body



D*Calculator

To further individualize vitamin D dosing options, use the vitamin D*calculator at grassrootshealth.net/dcalculator, which offers a more accurate calculation based on weight, starting vitamin D level, and preferred target vitamin D level.

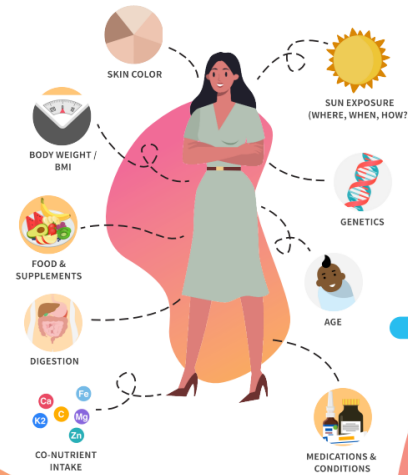


BEST PRACTICE RESOURCES GRASSROOTSHEALTH NUTRIENT RESEARCH INSTITUTE

Moving Vitamin D Research into Practice: Addressing Vitamin D Deficiency to Improve Patient Outcomes, Population Health & Reduce Costs

Did you know that 75% of the world is estimated to be vitamin D deficient? This educational course aims to get the latest vitamin D public health science and best practice protocols, direct from world-renowned vitamin D researchers, into the hands of healthcare professionals and individuals... moving research into practice to impact patient outcomes and population health, and potentially reducing healthcare costs across the globe.

Factors that can affect your Vitamin D level:



KNOW "D" NUMBER

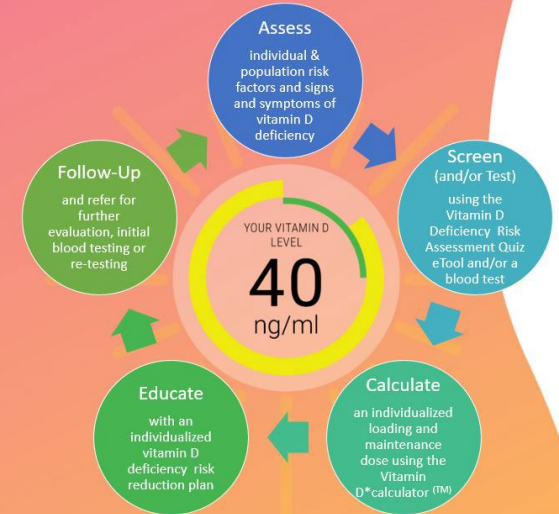


Patient and Provider Guide to Understanding Vitamin D, Testing & Results

YOUR VITAMIN D LEVEL
40

The Cycle of Best Practices for Addressing Vitamin D Deficiency

(Sanford & Aliano, 2022)



RECOMMENDED NEXT STEPS

- Create policies and procedures related to vitamin D testing and repletion for your facility
- Partner with a local lab for lower cost 25(OH)D testing for your residents and staff (such as community birthday labs)
- Create a Quality Improvement project with facility-specific metrics, i.e., wound healing, CAUTI, behaviors, medication use, staff sick days, etc. using the Heaney criteria for nutrient study design (pre-post 25(OH)D serum concentrations, vitamin D*calculator for individual weight-specific recommendations)
- Create a staff education and testing event, offer discounted testing services and education
- Disseminate the findings of QI projects at a local or national conference
- Gather interdisciplinary professionals for a Northern Plains vitamin D conference (Vitamin D in Aging track?)

What does great look like? If you aren't sure, ask! I'd love to help 😊

The Social Ecological Model of Health



Adapted by TeoKa Golden © 2019



SUMMARY

- Achieving and maintaining 25(OH)D serum concentrations of **40-60 ng/mL** for optimal human health and functioning is imperative for residents and staff in congregate living settings, such as long-term care facilities.
- Implementation of these interventions is expected to improve health outcomes for long-term care residents and staff.
- Many hands make light work!



ONWARD TO BETTER HEALTH FOR ALL!

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