DR. HYMAN+

PREVENTION AND TREATMENT OF OSTEOPOROSIS USING FUNCTIONAL MEDICINE

Elizabeth Board, MD DABA, IFMCP
Atlanta Functional Medicine

Why is Bone Density Important?

Impact of Movement/Exercise

- Cardiovascular fitness
- Metabolism (managing blood sugar and insulin)
- Stress reduction
- Cancer risk reduction
- Detoxification
- Depression booster, increases dopamine
- Improves and maintains cognition; increases BDNF

Ruegsegger, G. N., & Booth, F. W. (2018). Health Benefits of Exercise. *Cold Spring Harbor perspectives in medicine*, *8*(7), a029694
Lieberman D.E. (2013). *The Story of the Human Body*. New York: Vintage Books

Cerebrovascular and Cognitive Functioning

JCBFM

Review Article

Journal of Cerebral Blood Flow & Metabolism
2021, Vol. 41(3) 447–470

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Benefits of exercise training on cerebrovascular and cognitive function in ageing

Edward S Bliss[1], Rachel HX Wong[2,3], Peter RC Howe[2,3,4] and Dean E Mills[1]

Abstract

tion and neuroplasticity through areas of the brain associated with executive function and memory in adults 50 years or older, irrespective of their health status. However, more research is required to ascertain the mechanisms of action.

"evidence indicated that exercise can improve cerebrovascular function, cognition and neuroplasticity through areas of the brain associated with executive function and memory in adults 50 years or older, irrespective of their health status.

Functional Medicine Deep Dive

DR. HYMAN+

Why is Bone Density Important?

- Prevent chronic pain: produce endorphins, produce synovial fluid in joints
- Avoid digestive and respiratory disorders caused by vertebral fractures
- Prevent disability: maintain muscle mass, neuromuscular control, balance
- Maintain independence: nearly 40% of persons who experience a fracture are unable to walk independently at 1 year, and 60% require assistance with at least 1 essential activity of daily living

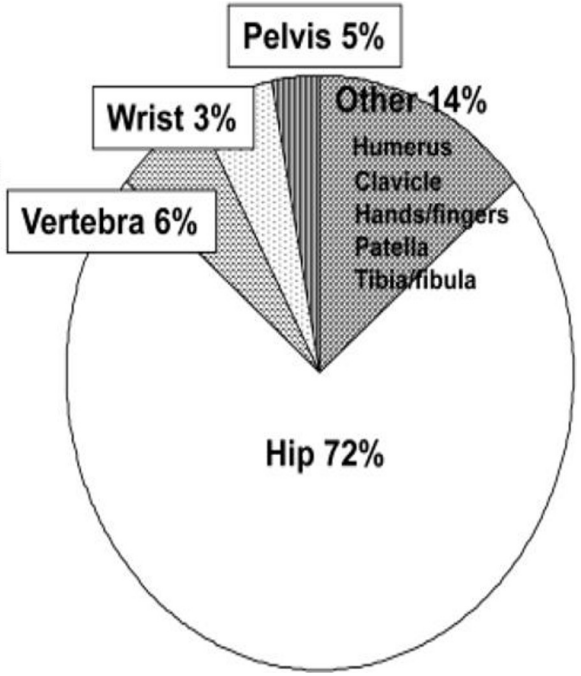
JAMA (2018) Screening for Osteoporosis to Prevent Fractures: US Preventive Services Task Force. Jun 26;319(24):2521-2531
Ruegsegger, G. N., & Booth, F. W. (2018). Health Benefits of Exercise. *Cold Spring Harbor perspectives in medicine*, *8*(7), a029694.

OSTEOPOROSIS FINANCIAL IMPACT

Direct cost was $16.9 billion in 2005

94% of cost was for nonvertebral sites

57% was spent on inpatient care
30% was spent on long-term care
13% was spent on outpatient care



2019 report

The national annual expense of osteoporotic fractures among Medicare beneficiaries, including direct medical costs and **indirect societal costs**, has been estimated at **$57 billion** in 2018, with an expected increase to over **$95 billion** in 2040.

Endocr Pract. 2010 Nov-Dec; 16(Suppl 3): 1–37.
Lewiecki EM, Ortendahl JD, Vanderpuye-Orgle J, et al. Healthcare Policy Changes in Osteoporosis Can Improve Outcomes and Reduce Costs in the United States. JBMR Plus. May 2019.

Biggest Reason to Avoid Osteoporosis

Avoid early **DEATH**

- 21-30% of people who have a hip fracture die within 1 year.
- Male mortality after hip fracture is 3x higher than females.
- Higher death rates in Black men.

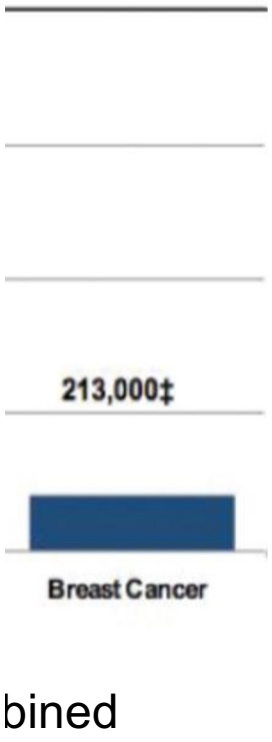
JAMA. 2018 Screening for Osteoporosis to Prevent Fractures: US Preventive Services Task Force. Jun 26;319(24):2521-2531
Rinonapoli, G et al (2021) Osteoporosis in Men: A Review of an Underestimated Bone Condition. *Int J Mol Sci*., 22, 2105
Vescini, F., et al (2021). Management of Osteoporosis in Men: A Narrative Review. *International journal of molecular sciences*, *22*(24), 13640.

AGENDA

- ✓ Why is osteoporosis prevention and treatment important to you a
- How widespread is this silent disease? Special focus on men
- What are the risk factors and root causes for Osteoporosis
- Introduce Functional Medicine Tools
  - Historical timeline to identify predisposing factors, triggering events and perpetuating contributors.
  - Organize and prioritize imbalanced biologic processes for treatment
  - Leverage modifiable lifestyle factors
- Applying functional lab testing: precision and confirmation of tailored treatment
- Review current pharmacologic treatments available: their risks and benefits
- Inspiring case reports.

Functional Medicine FUN PART

New Diagnoses of OSTEOPOROSIS Annually



bined

in U.S. women based on recent statistics (2004 to 2006).

Endocr Pract. 2010 Nov-Dec; 16(6): 1016–1019.
American Association Of Clinical Endocrinologists Medical Guidelines For Clinical Practice For The Diagnosis And Treatment Of Postmenopausal Osteoporosis: Executive Summary Of Recommendations
Nelson B. Watts, MD, FACP, MACE et. Al.

Prevalence in the US:

By 2020 expected 12.3 million diagnosed with Osteoporosis.

2010: 10.2 million older adults had osteoporosis.
Low bone mass prevalence: 43.9% = 43.4 million older adults

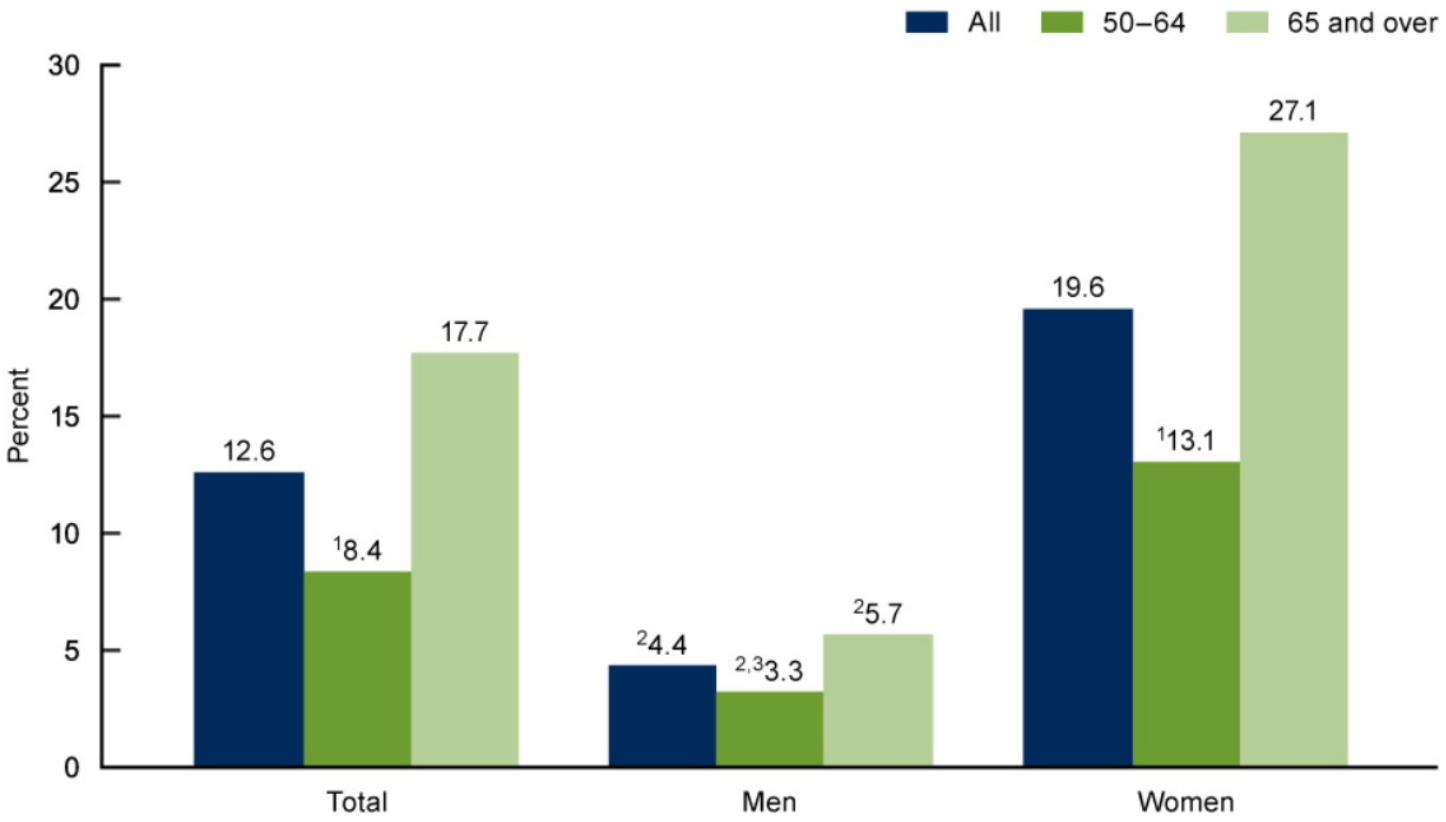
7.7 million non-Hispanic white, 0.6 million Mexican American, 0.5 million non-Hispanic black adults had osteoporosis.

Combined, osteoporosis and low bone mass affected an estimated **53.6 million older US adults in 2010.**

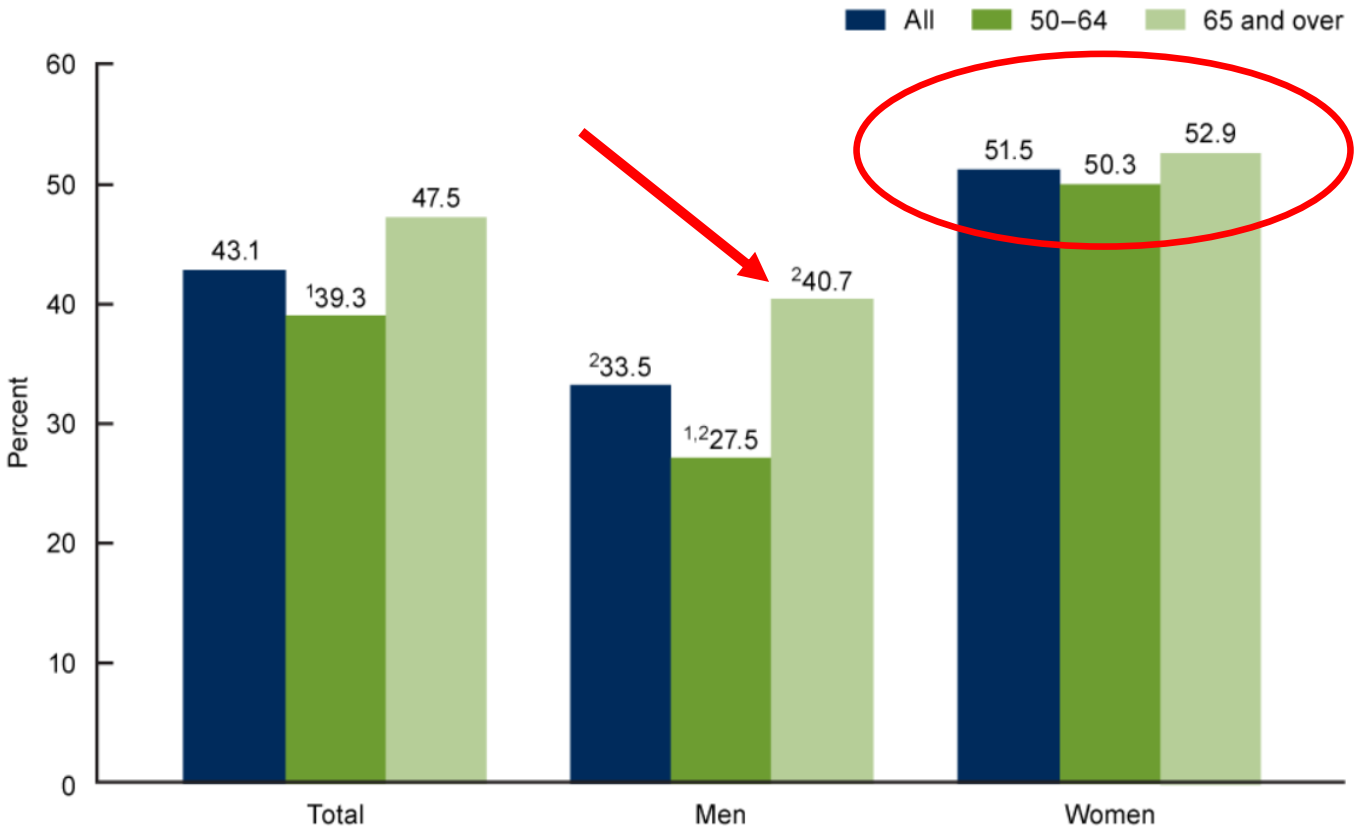
Although most with osteoporosis or low bone mass were non-Hispanic white women, many men and women from other racial/ethnic groups also had osteoporotic BMD or low bone mass.

Wright, N. C., et al. (2014), J Bone Miner Res, 29: 2520–2526. doi:10.1002/jbmr.
JAMA (2018) Screening for Osteoporosis to Prevent Fractures: US Preventive Services Task Force. Jun 26;319(24):2521-2531.

Prevalence of **osteoporosis** among adults 2017-2018.



Prevalence of **low bone mass** among adults 2017-2018.



The USPSTF recommends screening women 65 years and older, and women with increased risk factors.

Osteoporosis in Men

USPSTF recommends against routine DEXA screening –
evidence was "insufficient to assess the balance of benefits and harms of screening for osteoporosis to prevent osteoporotic fractures in men"

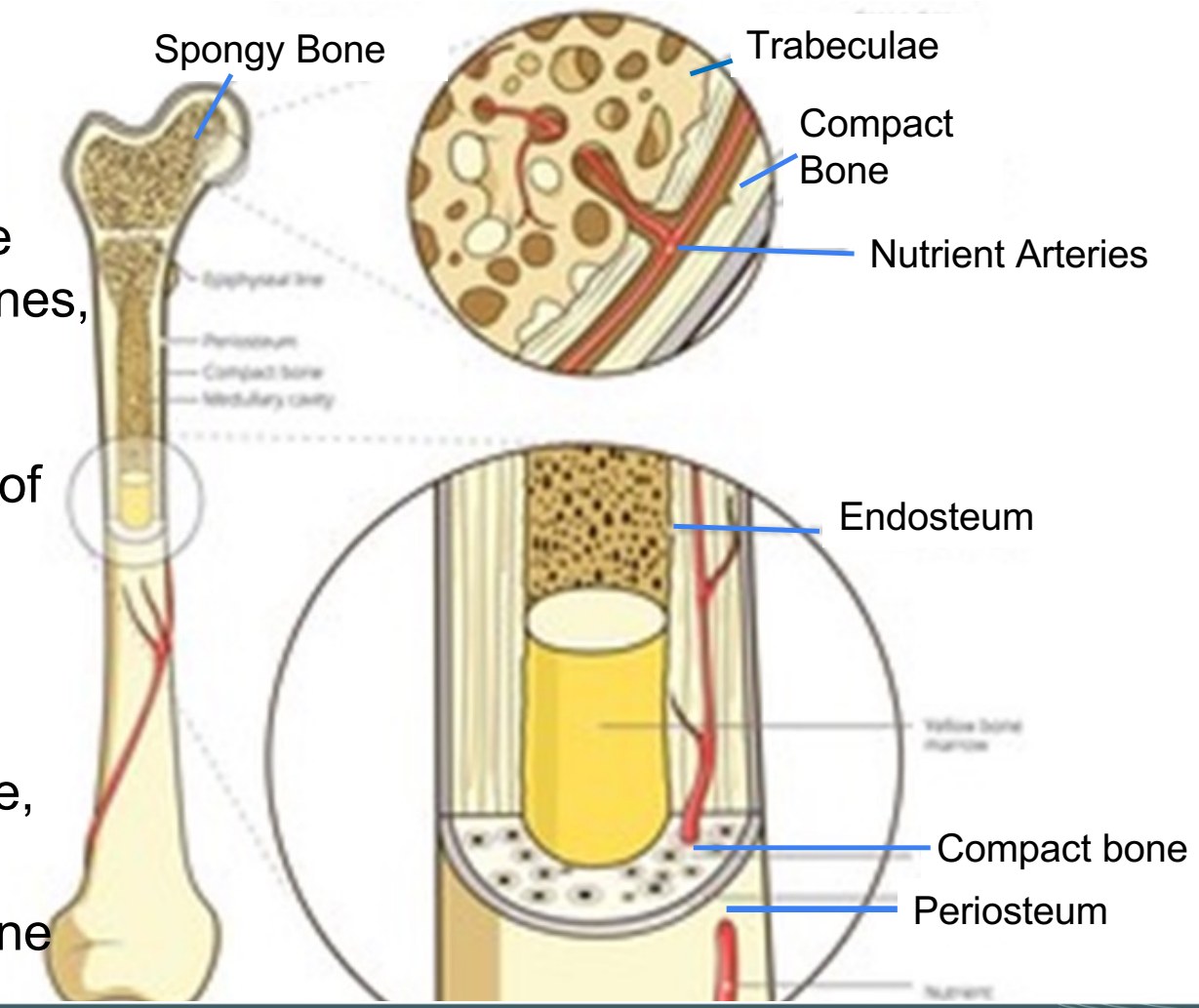
"underestimated, underdiagnosed and undertreated" - 2021 review by Rinonapoli, G

- roughly 29% of osteoporotic fractures in the US are from men
- sons of osteoporotic women, have early bone loss unrelated to age.
- men have a higher fracture-related mortality rate than women: 10 yr mortality 57.4% men and 48.4% of women
- hip fracture hospitalization, mortality rate:10.2% men vs. 4.7% of women - 2005
- Post hip fracture: only 8% of men received osteoporosis treatment as compared to 23.3% of women.

https://www.uspreventiveservicestaskforce.org/uspstf/recommendation/osteoporosis-screening
Rinonapoli, G et al Osteoporosis in Men: A Review of an Understeimated Bone Condition. *Int J Mol Sci*. 2021, 22, 2105.
Vescini, F et al. Management of Osteoporosis in Men. A Narrative review. *Int J Mol Sci*. 2021, 22, 13640.

Bone Structure

- **Periosteum**: fibrous membrane covering outer surface of all bones, except articular spaces.
- **Endosteum**: lining of the inner surface of the medullary cavity of long bones
- **Trabeculae**: columns, rods of connective tissue, supports & lightens
- **Spongy Bone**: cancellous bone, contains trabeculae
- **Cortical Bone**: dense outer bone



Osteoporosis: Men vs Women

Men

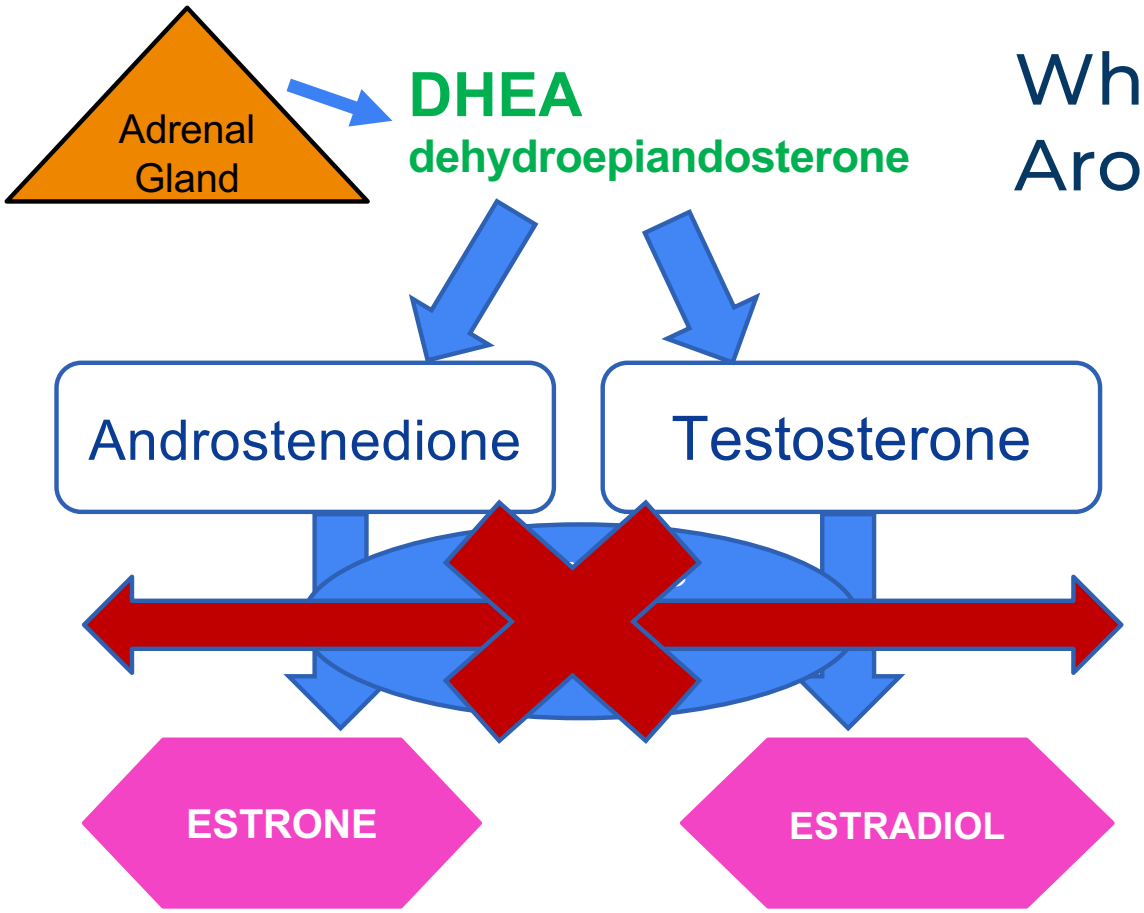
- Trabeculae thin out more, but connectivity maintained
- Thicker periosteum and more trabecular surface
- 65% is due to extra skeletal causes
- 20% of osteoporotic men have hypogonadism
- Testosterone inversely related to fracture risk: stimulates bone growth, and muscle for stability
- Aromatase deficiency is associated with decreased bone mass. CYP19A1 codes for aromatase
- Men at age 70 should get a DEXA to screen. Only 11% of men get screened currently

Wome

- Decrea… …d conne…
- Thinner peri…
- Smaller diameter bone… earlier bone resorption, and h…ner risk of falls.
- 20-40% is due to extra skeletal causes
- **Menopause** is the cause of most rapid bone loss in women
- Testosterone increases muscle mass

- DEXA at age 65, earlier if risk factors.

Rinonapoli, G et al Osteoporosis in Men: A Review of an Underestimated Bone Condition. *Int J Mol Sci*. 2021, 22, 2105.
Vescini, F et al. Management of Osteoporosis in Men. A Narrative review. *Int J Mol Sci*. 2021, 22, 13640



What Inhibits Aromatase ?

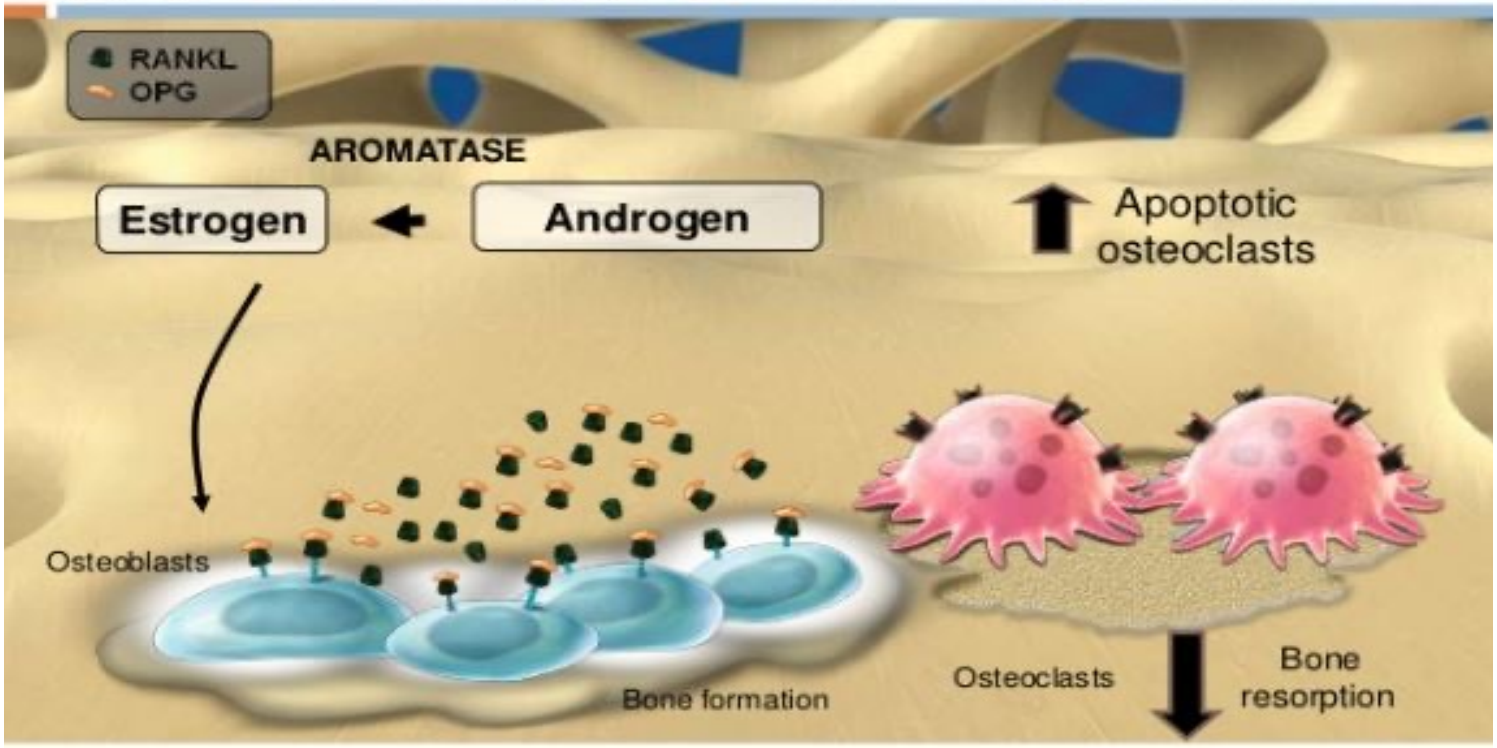
Medications

- Tamoxifen
- Metformin
- Ketoconazole

Smoking
Dioxin

CYP19A1 gene mutations

Estrogen Limits RANKL Expression and Stimulates OPG Production



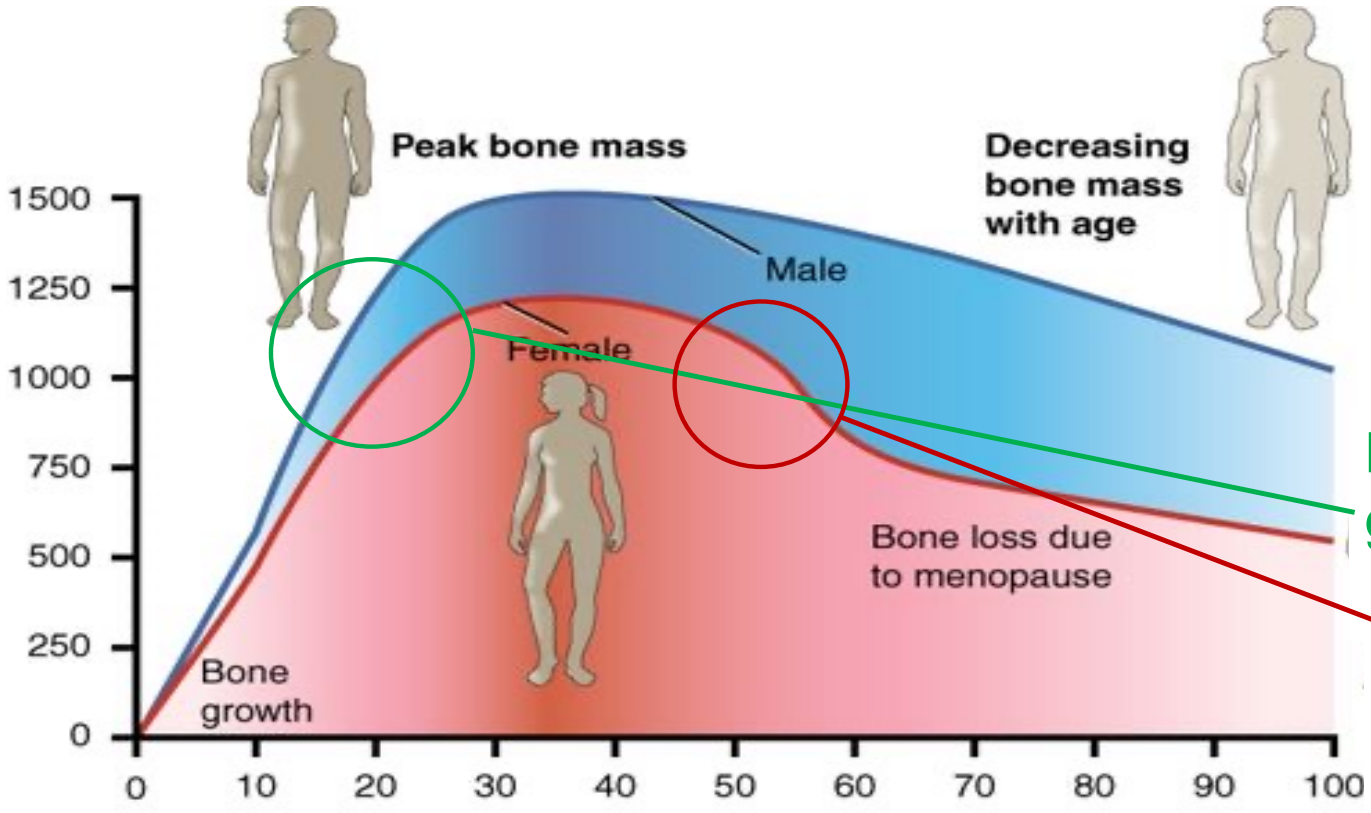
OPG, osteoprotegerin;
RANKL, receptor activator for nuclear factor κ B ligand.

Boyle WJ, *et al.* Nature 2003; 423:337-42.

Osteoclasts: clear out old bone

Osteoblasts: build bone

Age Related vs. Hormone Related Bone loss

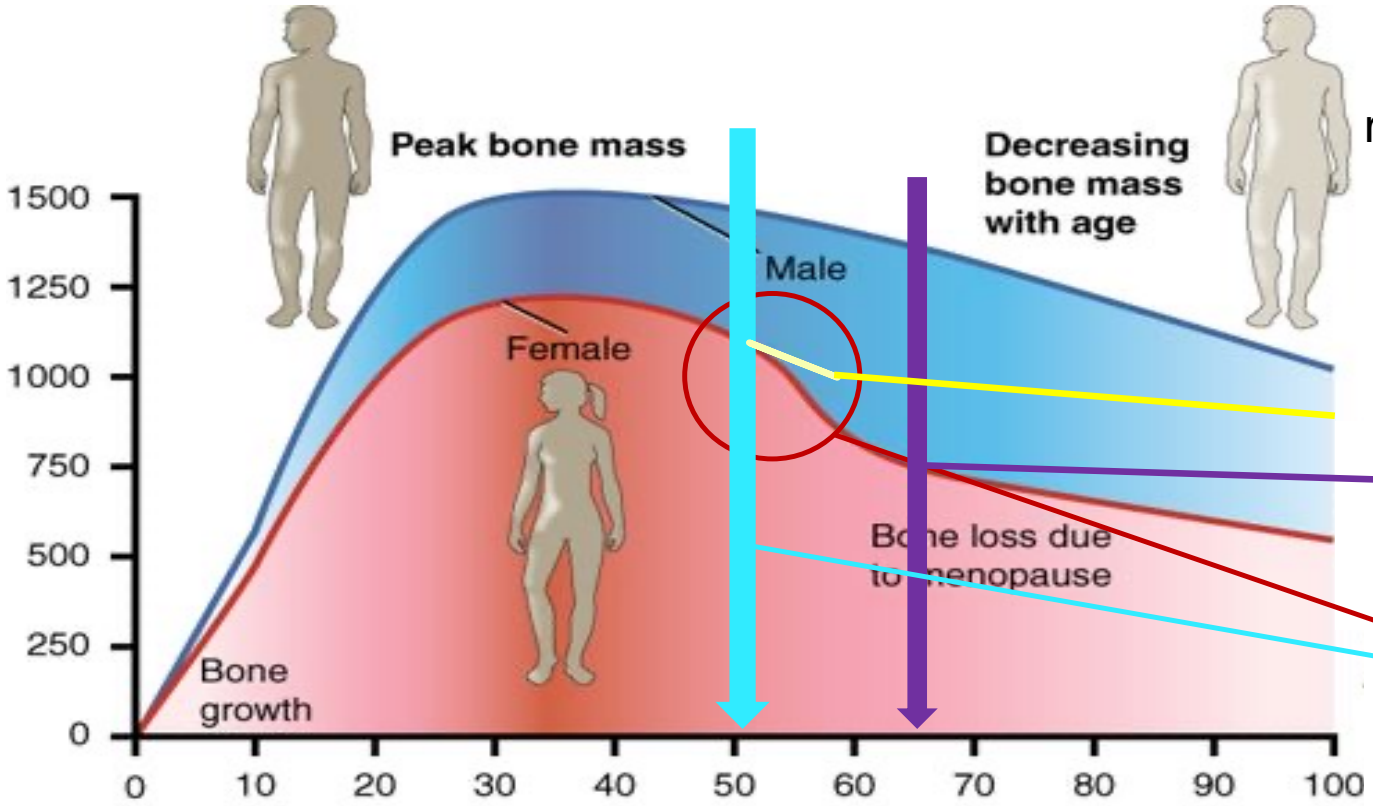


Estrogen decline in both genders → increased bone resorption and impaired bone formation, although women manifest the impact earlier.

Most Rapid bone growth

Most Rapid Bone Loss

Age Related vs. Hormone Related Bone loss



Estrogen decline in both genders → increased bone resorption and impaired bone formation, although women manifest the impact earlier.

When does USPSTF recommend Bone Density testing?

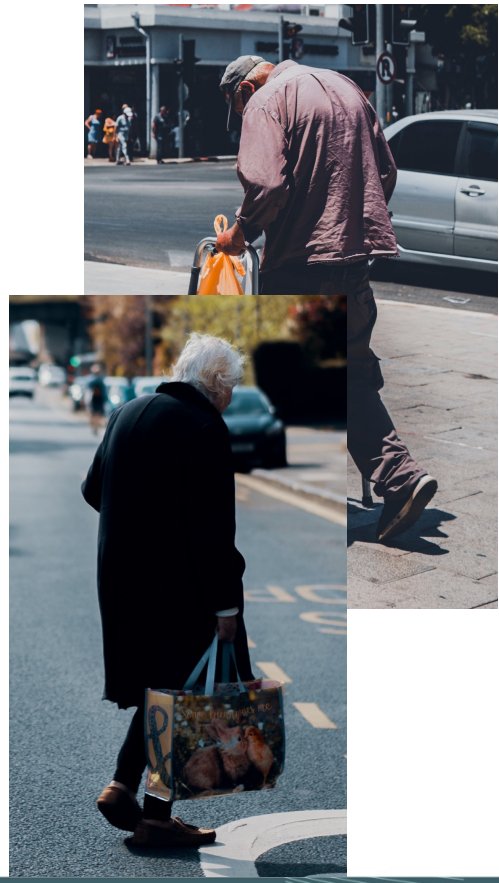
Average age of menopause? 50.5 yr

Most Rapid Bone Loss

CONVENTIONAL CLUES to make the DIAGNOSIS

- Insidious, silent, progressive condition: “dowager’s hump” a dorsal kyphosis
- Loss of height: loss of 1.5 inches raises the concern for vertebral fractures
- Tooth loss, dental caries
- Skeletal pain due to fractures, frequent fractures

often too late



Identify those at risk for osteoporosis and intervene BEFORE they fracture, lose teeth, height, and function.

Risk Factors ANTECEDENTS, TRIGGERS, MEDIATORS

- Females
- Age
- Low BMI, thin, petite
- Asian or white race
- Fragility fracture (adult)
- Parental hip fracture
- Latitude location
- Glucocorticoid Use
- Cigarette Smoking
- Weight loss
- Prolonged Stress
- Rheumatoid arthritis
- Alcohol: ≥ 10 per week
- Type 1 & 2 diabetes
- Chronic malnutrition
- Hyper or hypothyroidism
- Hyperparathyroidism
- Liver disease, chronic
- Kidney disease, chronic
- HIV infection
- Organ transplantation
- Prolonged immobility
- Hypogonadism, nulliparous
- Inflammatory Bowel Disease
- Malabsorption, Celiac
- COPD
- Medications
- Malignancies
- Environmental Toxins
- Chronic inflammation

Kanis, J. A.et.al (2019). European guidance for the diagnosis and management of osteoporosis in postmenopausal women. *Osteoporosis international : a journal established as result of cooperation between the European Foundation for Osteoporosis and the National Osteoporosis Foundation of the USA*, *30*(1), 3-44.

Case #1 Lucy

CCs: Lumbar Back Pain, Stalled weight loss, Insomnia

- 4y: Allergy to kale and mustard greens
- 12y: Menarche
- 20s-30s: smoker
- 39y:Dieting, lost 50 lbs eventually gained it back
- 40y: miscarriage, otherwise nulliparous.
- 43y: Hypothyroidism
- 49y: Dieting, lost 50 lbs eventually gained it back
- 42y: Hysterectomy (ovaries retained)
- 53y: Fall without fracture
- 53y:STRESS due to deaths of friends, family members
- 54y:Breast cancer diagnosis
- 55y:lumpectomy, tamoxifen, “normal” DEXA
- 55-56y: Increasing lumbar back pain, scar pain, cannot exercise
- 56y: “Post Menopausal” based on hormones
- 56y: Recent 50 lb weight loss, ketogenic diet

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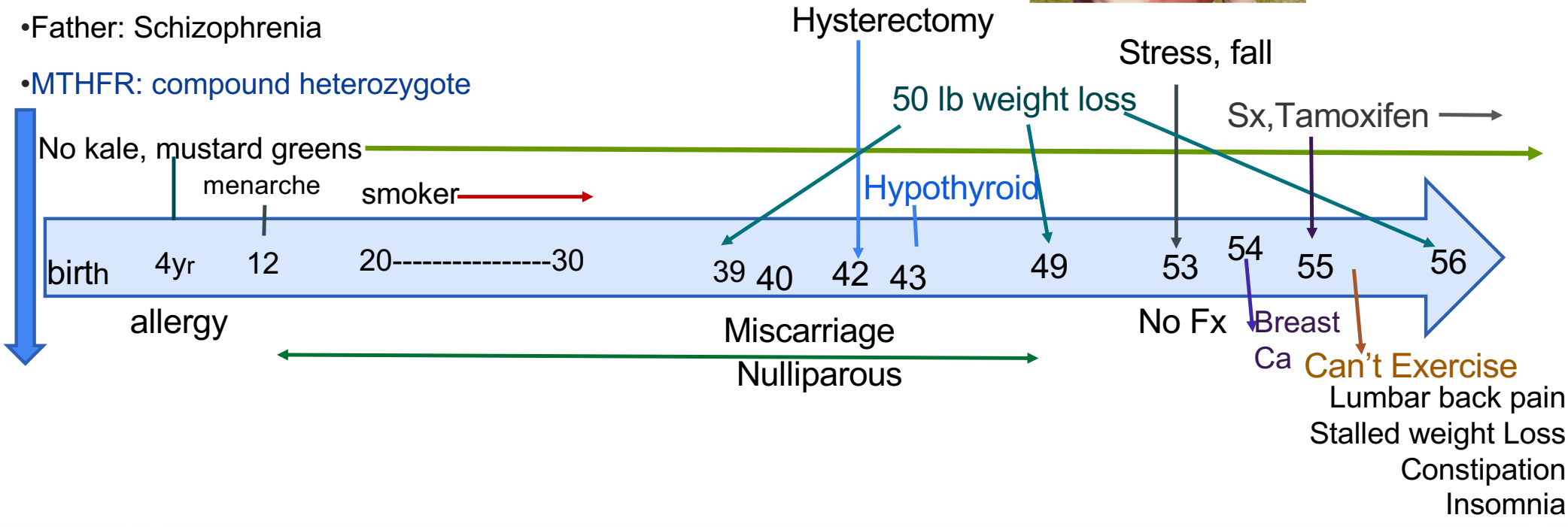
Lucy's Timeline

- Mat Grandmother: Stroke
- Mom: osteoarthritis, obesity, HTN, hypothyroid
- Mat Aunt: GERD, IBS, obesity, HTN, hypothyroid
- Pat Grandmother: Breast Cancer
- Father: Schizophrenia
- MTHFR: compound heterozygote



Case #1 Lucy

Deep Dive into her labs

- **PRIOR LABS**: 2015 normal DEXA “Oscal and Vit D”
- **Current LIFESTYLE**: Poor sleep. Can’t exercise due to back pain.
- NonGMO, organic, no soy, no gluten, no foods in mustard family, Paleo in 2015, began ketogenic 9 mo ago losing 50 pounds. Recent stress: deaths of friends/family. Supportive relationships.
- **Current sex hormone levels:** Low estrogen and progesterone after Tamoxifen.
- **Current Labs**: hsCRP: 5.7, MTHFR: compound heterozygote, 25-OH VitD: 47, coQ10 2.46, midday cortisol: 16.3, HbA1C: 5.4, TSH: 0.97, free T4: 1.37, free T3: 2.2, reverse T3:19, Alk Phos: 33

•Causes of Decreased ALK PHOS:

- Deficiency of: Zn, Vit C, B6, B9, B12, Mag, Phos

•Hypochlorhydria
•Celiac
•Hypothyroidism
•Excess Vit D

Measuring Bone Density

DXA: Dual-energy Xray Absorptiometry

- T scores: amount of bone density compared to young adult of your same height
- -1.1 to -2.4 is osteopenia
- -2.5 or more standard deviations from the mean is considered "osteoporosis"
- Z scores: amount compared to people in your age group.
- pDXAs: forearm

QCT: quantitative computerized tomography: much more radiation

- Differentiates trabecular vs.cortical bone.
- Only check L1 and L2
- Used for specific concerns

QUS: quantitative Ultrasound of the heel or the wrist as a screening measurement of bone density.

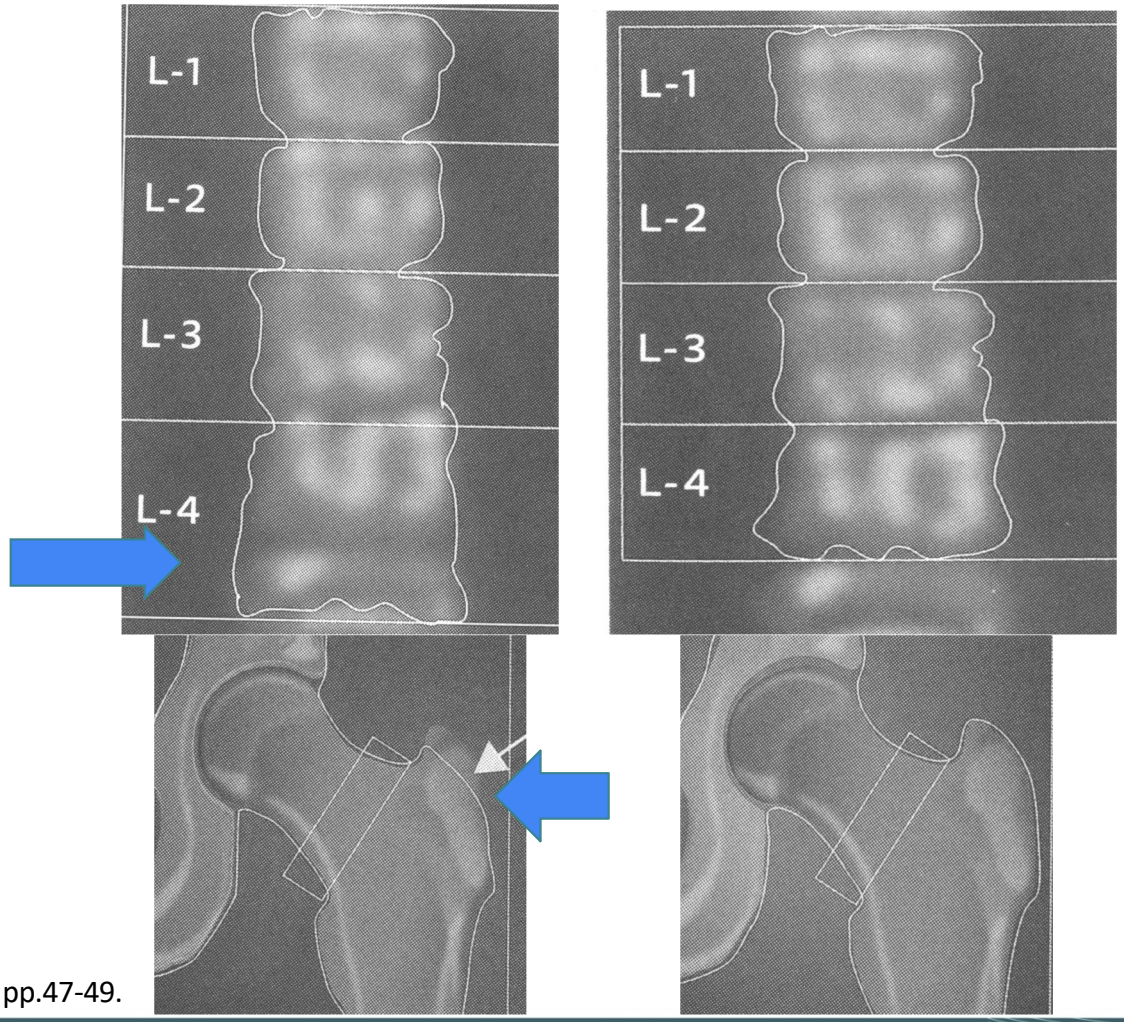
- Less specific and cannot be used to diagnose osteoporosis.
- Used as a screening tool.

Simpson, L., *Dr Lani's No-Nonsense Bone Health Guide*. 2014, pp.78-80

DIAGNOSIS

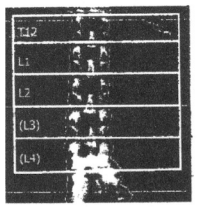
Tips for an accurate DEXA:

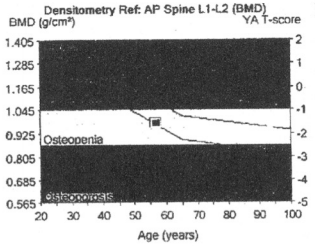
- Same machine.
- Same technician.
- Look at the tracings.
- Dismiss bone that is arthritic/degenerative because it can overestimate bone density.
- DEXA is less accurate in the very small boned (children).
- Cannot differentiate between cortical and trabecular bone



Simpson, L., *Dr Lani's No-Nonsense Bone Health Guide*. 2014, pp.47-49.

DEXA 2017

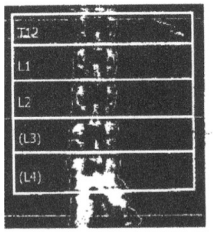


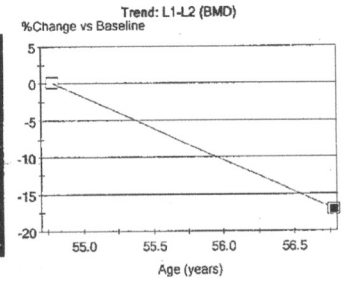


Region	BMD (g/cm²)	Young-Adult T-score	Age-Matched Z-score
L1	0.989	-1.2	-0.6
L2	0.964	-2.0	-1.3
L3	1.081	-1.0	-0.4
L4	1.376	1.5	2.1
L1-L2	0.976	-1.6	-1.0

Matched for Age, Weight (females 25-100 kg), Ethnic
USA (Lunar) (ages 20-40) AP Spine Reference Population (v112)
Statistically 68% of repeat scans fall within 1SD (± 0.020 g/cm² for AP Spine L1-L2)

Image not for diagnosis





Measured Date	Age (years)	BMD (g/cm²)	Change vs Previous (%)	Change vs Baseline (%)
Trend: L1-L2				
8/22/2017	56.7	0.976	-17.1 *	-17.1 *
8/21/2015	54.7	1.177	-	baseline

17.1% reduction

Statistically 68% of repeat scans fall within 1SD (± 0.020 g/cm² for AP Spine L1-L2)

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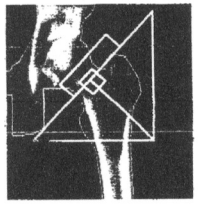

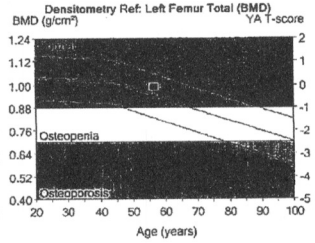

Region	BMD (g/cm²)	Young-Adult T-score	Age-Matched Z-score
Neck	0.936	-0.4	0.3
Total	0.989	-0.1	0.4

osteopenia
ø osteoporosis
Cr + vit D
1000 mg
qd

Matched for Age, Weight (females 25-100 kg), Ethnic
USA (Lunar) (ages 20-40) Femur Reference Population (v112)
Statistically 68% of repeat scans fall within 1SD (± 0.012 g/cm² for Left Femur Total)

Dexa Pt notified BE

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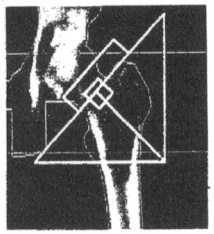
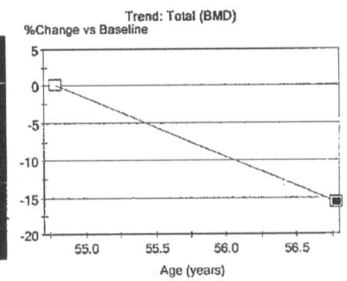


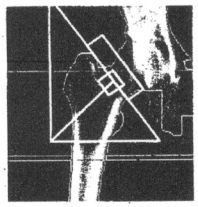


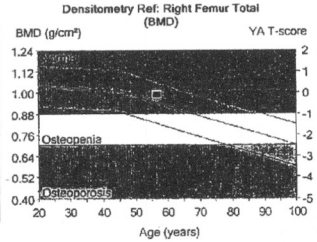
Measured Date	Age (years)	BMD (g/cm²)	Change vs Previous (%)	Change vs Baseline (%)
Trend: Total				
8/22/2017	56.7	0.989	-15.7 *	-15.7 *
8/21/2015	54.7	1.173	-	baseline

15.7 % reduction

Statistically 68% of repeat scans fall within 1SD (± 0.012 g/cm² for Left Femur Total)

Image not for diagnosis





Region	BMD (g/cm²)	Young-Adult T-score	Age-Matched Z-score
Neck	0.966	-0.1	0.6
Total	0.993	-0.1	0.4

Matched for Age, Weight (females 25-100 kg), Ethnic
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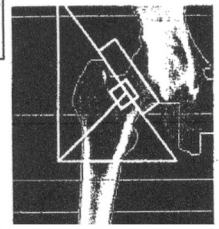
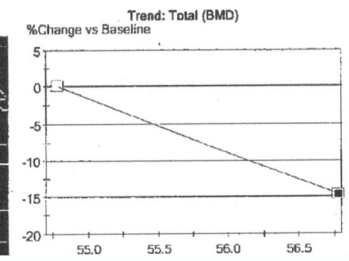




Measured Date	Age (years)	BMD (g/cm²)	Change vs Previous (%)	Change vs Baseline (%)
Trend: Total				
8/22/2017	56.7	0.993	-14.8 *	-14.8 *
8/21/2015	54.7	1.165	-	baseline

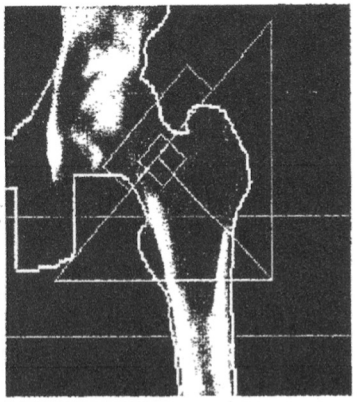
14.8 % reduction

FRAX

- Algorithm to provide an estimate of the probability of fracturing a bone within 10 years.
- Factors include: age, sex, height, weight, prior fx, parental fx, smoker, steroid use, RA, EtOH use
- Integrates established risk factors and BMD from the DEXA fem neck.
- Used to influence need to start treatment.

Simpson, L., *Dr Lani's No-Nonsense Bone Health Guide*. 2014, pp.84-85.

FRAX* RESULTS: *(version: 3.1)*



10-year Probability of Fracture[1]	
Major Osteoporotic Fracture[2] 5.9%	Hip Fracture 0.2%

Population:	USA (Caucasian)
Risk Factors:	None
NOF/ISCD Filters:	None

Based on Femur (Left) Neck BMD

1 -The 10-year probability of fracture may be lower than reported

2 -Major Osteoporotic Fracture: Clinical Spine, Forearm, Hip or

*FRAX is a trademark of the University of Sheffield Medical Sc
World Health Organization (WHO) Collaborating Centre.

ASSESSMENT:

The probability of a major osteoporotic fracture is 5.9% within the next ten years.

The probabili

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All treatment
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In addition, t
with a:
* Hip or vert
* T-score of
* Ten-year fr

FOL

People with
Medicare, routine testing is allowed once every 2 years. The testing frequency can be increased to one year for patients who have rapidly progressing disease, those who are receiving or discontinuing medical therapy to restore bone mass, or have additional risk factors.

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= 50 years

ible for

Treatment in postmenopausal women and men with a:

- Hip or vertebral fracture
- T score of $\leq$ -2.5 at spine or hip
- Ten year FRAX $\geq$ 3% hip fracture or $\geq$ 20% major osteoporotic fracture

Conventional Treatment Plan

“Oscal and Vit D”

- Ingredients: Calcium Carbonate, Corn Syrup Solids , Contains Less Than 2% of Talc, Corn Starch, Sodium Starch Glycolate , Polysorbate 80, Polyvinyl Alcohol, Polyethylene Glycol 3350, Titanium Dioxide, Yellow 5 Lake, Blue 1 Lake, Calcium Stearate, Methylparaben and Propylparaben (Preservative), Gelatin, Sucrose, Cholecalciferol (Vitamin D3), Di-Alpha Tocopherol
- 500mg Calcium carbonate and 200iu of Vitamin D3

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- 500mg Calcium carbonate and 200iu of Vitamin D3

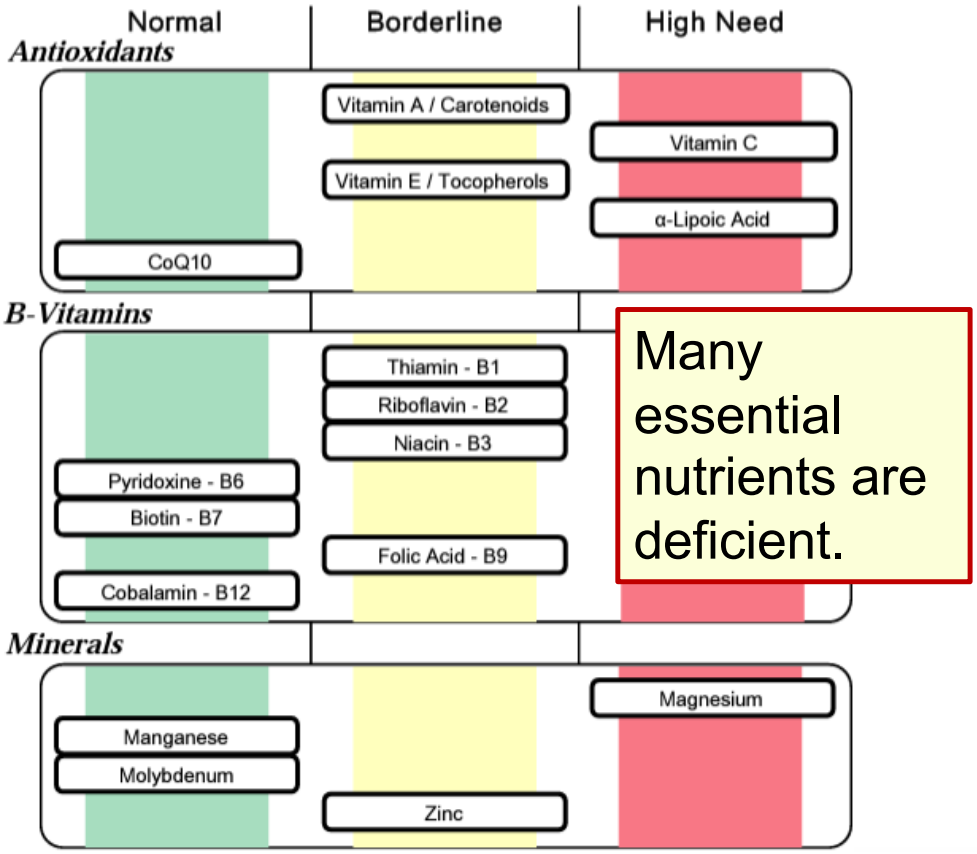
Let's dive deeper to discover Lucy's Root Cause(s) of 17% drop in bone density

TREATMENT PLAN for L. B.

- Sleep improved with magnesium and resolution of pain with low dose naltrexone. She wants to increase her exercise, but what kind?
- How much did not being able to exercise impact her bone loss?
- On a restricted ketogenic diet, can she be missing key ingredients, like Vit K_2?
- Is her digestion and absorption adequate?
- Could she be missing minerals which could explain her low alkaline phosphatase?
- Are her low free T3 and mildly elevated reverse T3 impacting her decreasing bone density? Could key mineral deficiencies be the root cause of poor T3?
- Can her hormones be further optimized safely, or is estrogen truly necessary for her to build bone?

Functional Nutritional Testing

Maldigestion of Protein



Many essential nutrients are deficient.

Essential Amino Acids

Amino Acid		Reference Range
Arginine	6.5	6.0-17.5
Histidine	7.8	6.5-13.3
Isoleucine BCAA	5.48	5.79-18.69
Leucine BCAA	12.2	12.1-36.1
Lysine	22.8	13.7-34.7
Methionine	4.0	2.3-6.5
Phenylalanine	6.22	6.07-17.46
Taurine	7.03	4.41-10.99
Threonine	16.12	6.42-16.32
Tryptophan	3.30	2.65-6.67
Valine BCAA	31.0	18.3-42.6

Functional Nutrition Testing

Nonessential Amino Acids

Alanine	28	23-62
Asparagine	5.3	3.5-11.6
Aspartic Acid	<dl	<= 0.67
Cyst(e)ine	7.8	5.9-19.9
γ-Aminobutyric Acid	<dl	<= 0.06
Glutamic Acid	3.5	2.0-14.5
Glutamine	49	-111
Proline	15	-57
Tyrosine	6.1	6.2-18.5

Tyrosine is the building block for Thyroid hormone

Poor conversion of T4 → T3
Added Selenium and Zinc to better convert T3.

Element	Reference Range	Reference Range
Copper *(plasma)*	171.2	75.3-192.0 mcg/dL
Magnesium *(RBC)*	37.6	30.1-56.5 mcg/g
Manganese *(whole blood)*	15.3	3.0-16.5 mcg/L
Potassium *(RBC)*	2,676	2,220-3,626 mcg/g
Selenium *(whole blood)*	144	109-330 mcg/L
Zinc *(plasma)*	81.9	64.3-159.4 mcg/dL

Risk Factors

ANTECEDENTS, TRIGGERS, MEDIATORS

- Females
- Age
- Low BMI, thin, petite
- Asian or white race
- Fragility fracture (adult)
- Parental hip fracture
- Latitude location
- Glucocorticoid Use
- Cigarette Smoking
- Weight loss X 3
- Prolonged Stress
- Rheumatoid arthritis
- Alcohol: ≥ 10 per week
- Type 1 & 2 diabetes
- Chronic malnutrition
- Hyper or hypothyroidism
- Hyperparathyroidism
- Liver disease, chronic
- Kidney disease, chronic
- HIV infection
- Organ transplantation
- Prolonged immobility
- Hypogonadism, nulliparous
- Inflammatory Bowel Disease
- Malabsorption, Celiac
- COPD
- Medications
- Malignancies
- Environmental To
- Chronic Inflammation

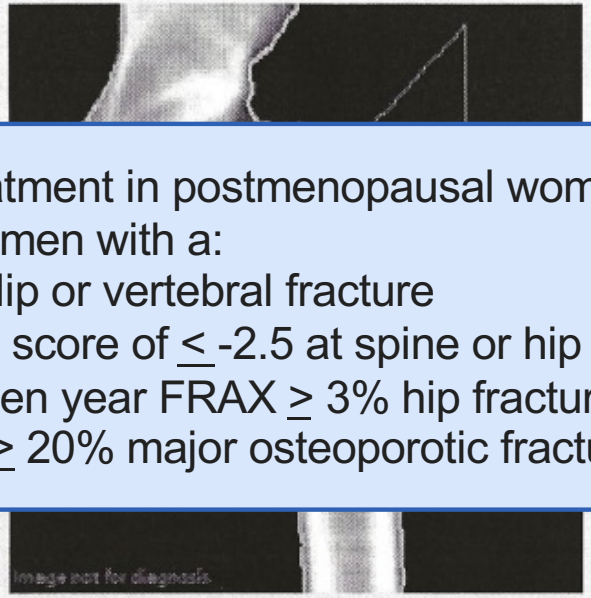
Kanis, J. A.et.al (2019). European guidance for the diagnosis and management of osteoporosis in postmenopausal women. *Osteoporosis international : a journal established as result of cooperation between the European Foundation for Osteoporosis and the National Osteoporosis Foundation of the USA*, *30*(1), 3-44.

TREATMENT PLAN Case #1 L. B.

- Is her digestion and absorption adequate? She had a positive test revealing an HCl deficiency. Started on Betaine HCl; noted improved bloating.
- Replaced all micronutrients found deficient with nutritional testing.
- Add in thyroid nutrient support, recheck with improved T4→ T3 levels.
- Breast cancer on Tamoxifen, consider adding progesterone?
- Withdraw all bone building saboteurs: Stress, no steroids, decrease high protein diet if acidic urine, favor alkaline diet, check Cd, decrease inflammation.
- Add back in fast walking, posture and pilates.
- Balance exercises and fall prevention.
- Do not smoke. Check production of nitric oxide.

Repeat DXA

FRAX* Based on femoral neck BMD: DualFemur (Left)

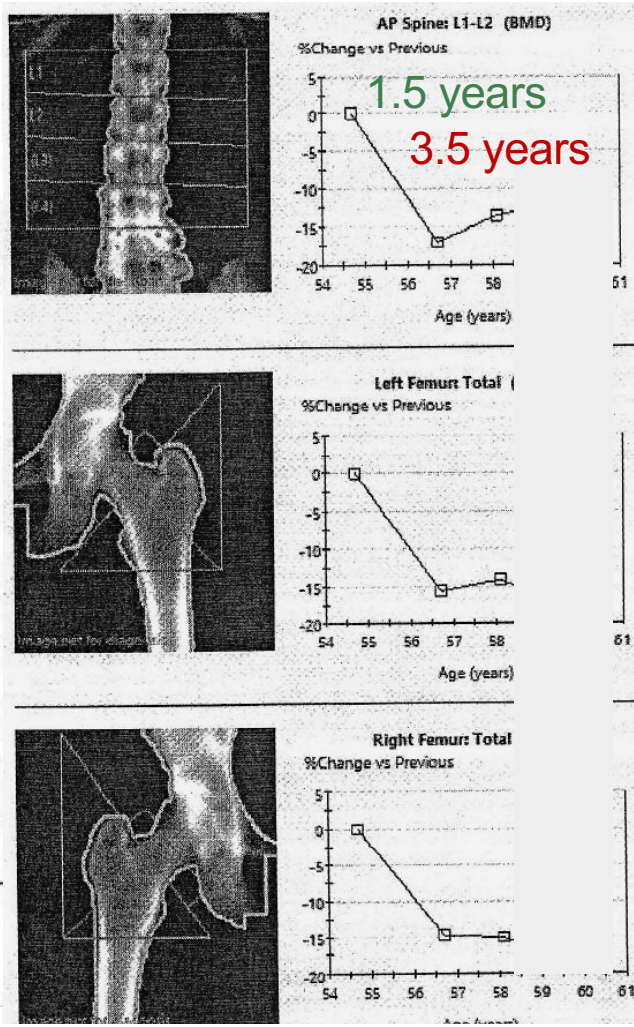


Treatment in postmenopausal women and men with a:

- Hip or vertebral fracture
- T score of ≤ -2.5 at spine or hip
- Ten year FRAX ≥ 3% hip fracture or ≥ 20% major osteoporotic fracture

of Fracture

Major Osteoporotic Fracture:	**7.4 %**
Hip Fracture:	**0.5 %**
Population:	USA (Caucasian)
Risk Factors:	None



Trend: L1-L2

Measured Date	Measured Age	BMD (g/cm²)	Change vs Baseline (%)	Change vs Previous (%)
01/27/2021	60.2	1.035	-12.1 *	2.5
01/14/2019	58.1	1.010	-14.2 *	3.5
08/22/2017	56.7	0.976	-17.1 *	-17.1 *
08/21/2015	54.7	1.177	baseline	-

T = -1.1

Trend: Total Left

Measured Date	Measured Age	BMD (g/cm²)	Change vs Baseline (%)	Change vs Previous (%)
01/27/2021	60.2	0.955	-18.6 *	-4.9 *
01/14/2019	58.1	1.004	-14.4 *	1.5
08/22/2017	56.7	0.989	-15.7 *	-15.7 *
08/21/2015	54.7	1.173	baseline	-

T= -1.3

Trend: Total Right

Measured Date	Measured Age	BMD (g/cm²)	Change vs Baseline (%)	Change vs Previous (%)
01/27/2021	60.2	0.951	-18.4 *	-3.9 *
01/14/2019	58.1	0.990	-15.0 *	-0.3
08/22/2017	56.7	0.993	-14.8 *	-14.8 *
08/21/2015	54.7	1.165	baseline	-

T= -1.3

FUNCTIONAL TREATMENT PLAN
that grows bones

- How to avoid “oscal and vitamin D” solution?
- How to remember all the parts of the puzzle?

TREATMENT PLAN

- **G**ut: Proper digestion and absorption nutrients
- All **R**ight **R**aw materials: Zn, Mg, Se, Vit K2, AA . . .
- **O**ptimize hormones: Thyroid, DHEA, Estrogen, Testosterone, Progesterone
- **W**ithdraw “bone saboteurs”: coffee, EtOH, medications, toxins, cortisol
- **S**timulate bone growth: strength training, posture, maintaining muscle mass
- **B**lood flow: Avoid smoking, ensure adequate vascular perfusion
- **B**alance and fall prevention

Opportunities to intervene throughout one's lifetime

Family History: Investigate which genetic snps are present, compensate

Begin bone health prevention in childhood.

Recognize risks that arise in childhood, during and after puberty, young adulthood, peri menopausal and postmenopausal.

Let's walk quickly through events and conditions that can trigger and contribute to osteoporosis, many of which can be treated or improved.

https://www.bonehealthandosteoporosis.org/preventing-fractures/nutrition-for-bone-health/peak-bone-mass/

Book Resources

- Simpson, Lani. *Dr. Lani's No-Nonsense Bone Health Guide: The Truth about Density Testing, Osteoporosis Drugs and Building Bone Quality at Any Age*, Nashville, TN: Hunter House, 2014.
- Pizzorno, Lara & Jonathan Wright. *Your Bones: How YOU can prevent Osteoporosis & Have Strong Bones for Life- Naturally.* Edinburgh, VA:Pratikos, 2013.
- McCormick, R. Keith. *The Whole Body Approach to Osteoporosis: How to Improve Bone Strength and Reduce Your Fracture Risk.* Oakland, CA: New Harbinger Pub, 2008.
- Lanou, Amy Joy and Michael Castleman. *Building Bone Vitality: A Revolutionary Diet Plan to Prevent Bone Loss and Reverse Osteoporosis*, McGraw-Hill, 2009.
- PubMed articles, Medscape Articles.

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