

## The Medicalization of Life



Tieraona Low Dog, MD

Author of *"Fortify Your Life"*  
*"Healthy At Home"* and  
*"Life Is Your Best Medicine"*

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## Three Key Aspects of Medicalization

- *Clinical*: serious **side effects of treatment** worse than original condition
- *Social*: public is made reliant on medical profession to cope with life
- *Structural*: the idea of birth, aging and dying as medical illnesses, leaves individuals and societies less able to deal with these "natural" processes.

Ivan Illich, *Limits to medicine: Medical nemesis* 1975

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The more people are exposed to contemporary health care, the more they perceive themselves to be sick, or at risk, and the higher the rates of self-reported illness.

Sen A. Health: perception versus observation. *British Medical Journal*. 2002;324:860-861

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## Decision Making



Uncertainty due to :

- lack of convincing evidence from clinical studies
- applicability of evidence from research to the bedside
- interpretation of data

Evidence is expressed on a continuum scale of credibility, decision making is about choice.

Uncertainty is the leading cause of excessive diagnostic testing and inappropriate treatments.

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## Osteoporosis

- Osteoporosis, literally "porous bones," is a skeletal disorder characterized by low bone mass and structural deterioration of bone tissue, with a consequent increase in susceptibility to fragility fracture.
- It is a multifactorial disease arising from genetic, hormonal, metabolic, mechanical and immunological factors.
- In the US, percent of men 50 years of age and over with osteoporosis of the femur neck or lumbar spine is 4%, and for women, 16%.
- 25.7 and 12.8% (women, men) for those aged 65 to 79 years and more than 25% for those aged 80 years and older.

[https://www.cdc.gov/nchs/data/hestat/osteoporosis/osteoporosis2005\\_2010.htm](https://www.cdc.gov/nchs/data/hestat/osteoporosis/osteoporosis2005_2010.htm)

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## Over Treatment?

- New definition of osteoporosis in 1994 based on low bone mineral density, expanded indications for pharmacotherapy.
- Under US guidelines ~75% of white women over 65 years are now candidates for drug treatment.
- Meta-analysis shows 175 postmenopausal women with bone fragility must be treated for about three years to prevent one hip fracture.

Jarvinen T, et al. *BMJ* 2015;350:h2088

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## DXA Scan

Table 1. World Health Organization Classification of T Score

Normal	$BMD \geq -1.0$
Low bone mass (osteopenia)	$BMD > -2.5$ and $< -1.0$
Osteoporosis	$BMD \leq -2.5$
Severe (established) osteoporosis	$BMD \leq -2.5$ with history of fragility fracture

T-scores are based on the NHANES reference values for women aged 20-29 years. The same absolute values are used in men.

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<http://www.shef.ac.uk/FRAX/>

Country : US (Caucasian) Name / ID : About the risk factors ⓘ

**Questionnaire:**

1. Age (between 40-90 years) or Date of birth  
 Age: 61 Y 1947 M 9 D 22

2. Sex ☐ Male ☒ Female

3. Weight (kg) 70.31

4. Height (cm) 167.64

5. Previous fracture ☒ No ☐ Yes

6. Parent fractured hip ☒ No ☐ Yes

7. Current smoking ☒ No ☐ Yes

8. Glucocorticoids ☒ No ☐ Yes

9. Rheumatoid arthritis ☒ No ☐ Yes

10. Secondary osteoporosis ☒ No ☐ Yes

11. Alcohol 3 or more units per day ☒ No ☐ Yes

12. Femoral neck BMD (g/cm<sup>2</sup>)  
 Selected DXA -1.8

Clear Calculate

**BMI 25.0**  
 The ten year probability of fracture (%)

**without BMD**

Major osteoporotic	10
Hip fracture	1.0

One of best predictive tools for evaluating fracture risk is FRAX

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## Guidance in the US



Consider FDA-approved medical therapies in postmenopausal women and men aged 50 years and older, based on the following:

- A hip or vertebral (clinical or morphometric) fracture
- T-score  $\leq -2.5$  at the femoral neck or spine after appropriate evaluation to exclude secondary causes
- Low bone mass (T-score between -1.0 and -2.5 at the femoral neck or spine) and a **10-year probability of a hip fracture  $\geq 3\%$  or a 10-year probability of a major osteoporosis-related fracture  $\geq 20\%$**  based on the US-adapted WHO FRAX
- Clinicians judgment and/or patient preferences may indicate treatment for people with 10-year fracture probabilities above or below these levels

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## Drug Induced Osteoporosis: Increased Risk

- Drugs include:
  - Glucocorticoids (steroids) – 1:5 cases of osteoporosis
  - Aromatase inhibitors (breast cancer)
  - Anti-androgen therapy (prostate cancer)
  - Proton pump inhibitors (heartburn)
  - Antiretroviral drugs (HIV, hepatitis)
  - SSRIs (antidepressants) and antipsychotics
  - Anticonvulsants (epilepsy)
  - Loop diuretics (e.g. lasix)
  - Heparin and oral anticoagulants



Mazziotti G, et al. *Am J Med* 2010; 123:877-84

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## Bisphosphonates

- Most commonly prescribed medication for prevention and treatment of osteoporosis.
- Antiresorptive therapies reduce fracture risk by inhibiting the activity of osteoclasts, reducing bone turnover and increasing bone mass.
- Meta-analyses consistently show benefit over placebo, particularly for lowering risk of vertebral fracture, as well as hip fracture, in those at high risk for fracture.
- Bisphosphonates may cause dyspepsia, nausea, esophagitis, abdominal pain and poor healing of bone.

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### Bisphosphonates for Fracture Prevention in **Post-Menopausal Women With Prior Fractures or With Very Low Bone Density** (NNT = 100)

**In Summary, for those who took the bisphosphonates:**

#### Benefits in NNT

- 1 in 20 were helped (vertebral fracture prevented)
- 1 in 100 were helped (hip fracture prevented)

#### Harms in NNT

- A small number were harmed

#### Benefits in Percentage

- 94% saw no benefit after 3 years of treatment
- 5% avoided a vertebral fracture
- 1% avoided a hip fracture

#### Harms in Percentage

- A small percentage were harmed

[www.thennt.com/nnt/bisphosphonates-for-fracture-prevention-in-post-menopausal-women-with-prior-fractures-or-very-low-bone-density/](http://www.thennt.com/nnt/bisphosphonates-for-fracture-prevention-in-post-menopausal-women-with-prior-fractures-or-very-low-bone-density/)

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## Bisphosphonates for Fracture Prevention in **Post-Menopausal Women Without Prior Fractures**

**In Summary, for those who took the bisphosphonates:**

### Benefits in NNT

- None were helped (fracture prevented after 3 years of medicine)

### Harms in NNT

- A small number were harmed

### Benefits in Percentage

- 100% saw no benefit after 3 years of treatment

### Harms in Percentage

- A small percentage were harmed

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## Impact on Bone

- Bisphosphonates suppress bone resorption that occurs during normal healing process, delaying bone healing.
- Osteonecrosis of the jaw is a serious adverse event associated with bisphosphonate use.
  - 1) Exposed bone in the maxillofacial region that is present for 8 weeks or more, 2) current or previous bisphosphonate use, and 3) no history of radiation therapy to the jaws.
- Risk factors: older than 65 years, periodontitis, prolonged use of bisphosphonates (for more than 2 years), smoking, wearing dentures, and diabetes.

*J Am Dental Assoc. 2011;142:1243-1251.*

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## Osteonecrosis of the jaw after tooth extraction in osteoporotic patients on oral bisphosphonates

- Clinical records of 320 osteoporotic patients who underwent tooth extraction while receiving oral bisphosphonates were reviewed. ***All patients had a healing period of more than 6 months following the extractions.***
- Eleven patients developed bisphosphonate related ONJ, reflecting an incidence rate of 3.44%.
- Patients on ibandronate (Boniva) showed highest incidence rate (5.0%); however, no statistically significant difference found according to the drug type.
- The incidence of BRONJ increased with age, was greater in the mandible than the maxilla, and was associated with a duration of administration of more than 3 years.

Ho-Gul Jeong, et al. *Imaging Sci Dent* 2017; Mar; 47(1): 45–5

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## Atypical Femur Fractures

- Atypical femur fractures (AFFs) present *a rare* but serious condition associated with use of bisphosphonates.
- Among women 68 years and older, treatment with a bisphosphonate for > 5 years was associated with an increased risk of subtrochanteric or femoral shaft fractures.
- Bisphosphonates must be discontinued but ongoing metabolic management in the form of calcium and/or vitamin D supplements is advisable. Teriparatide (Forteo – parathyroid recombinant) therapy can be considered as an alternative treatment.

Park-Wyllie, et al. *JAMA* 2011; 305(8):783-9

Koh A, et al. *Bone Joint J* 2017;99-B:295-302

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## Exercise

- Physical activity and mechanical loading help build peak bone mass, beginning in pre-pubertal years. Exercise consistently shown to prevent/reverse bone loss in lumbar spine and femoral neck.
- **Bone Estrogen Strength Training Study** found postmenopausal women who received 800 mg/d calcium citrate + structured exercise program, *increased muscle mass by 11-21% and BMD by ~2%.*
- Review of 37 studies found that physical exercise has a positive impact on muscle mass and function in healthy subjects aged 60 years and older.
  - The biggest effect of exercise intervention, of any type, has been seen on physical performance (gait speed, chair rising test, balance, SPPB test, etc.).

Beaudart C, et al. *Osteoporosis Int* 2017 Mar 1; 10.1007/s00198-017-3980-9

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## Strength and Balance Training Programs for Preventing Falls in the Elderly (NNT=11)

**In summary, for at-risk elderly community dwellers who used balance and strength training:**

### Benefits in NNT

- 1 in 11 at-risk elderly were helped (avoid suffering a fall over a one year period)

### Harms in NNT

- None were harmed

### Benefits in Percentage

- 91% saw no benefit
- 9% were helped by preventing a fall over a 1 year period

### Harms in Percentage

- 0% were harmed

<http://www.thennt.com/nnt/strength-and-balance-programs-for-elderly-falls/>

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## Protein and Fracture Risk



- Framingham Osteoporosis Study found **higher protein intakes** (60-83g/d versus 46g/d) in elder men and women (mean 75 years) were associated with a **37% decreased risk of hip fracture**.
- Women's Health Initiative found 20% increase in protein intake (15-18% of energy intake) improved bone mineral density maintenance and marginally lowered forearm fracture risk.
- European guidelines recommend 20-25 grams high quality protein with each meal for women over age 50 with regular physical activity/exercise 3-5 times/week.
- **No clinical data** support the hypothesis of a detrimental effect of high protein diet on bone health, except in the context of **inadequate calcium** supply.

Misra D, et al. *Osteoporosis Int* 2011; 22(1):345-349.  
 Beasley JM, et al. *Am J Clin Nutr* 2014; 99(4):934-940.  
 Calvez J, et al. *Eur J Clin Nutr*. 2012;66(3):281-295.  
 Rizzoli R, et al. *Maturitas* 2014; 79(1):122-32

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## Protein Intake and Fracture in Men

- As part of the Osteoporotic Fractures in Men Research, higher protein intake was associated with an 8% decreased risk of major osteoporotic fracture.
- **Increased dairy protein and non-dairy animal protein** associated with **a 20% and 16% decreased risk of hip fracture**, respectively.
- **Plant** protein **not** associated with decreased risk of hip fracture.
- Total protein was associated with a 16% decreased risk of hip fracture but not clinical spine fracture.
- Caution with high protein in those with severe kidney disease.

Langsetmo L, et al. *J Bone Miner Res* 2017; Mar;32(3):592-600

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## Marine Omega 3 Fatty Acids



- In animals, marine omega 3 attenuates bone loss associated with estrogen loss; **EPA enhances calcium absorption, reduces calcium excretion and increases calcium deposition in bone.**
- Findings from observational and RCTs suggest that higher fatty fish intake is strongly linked with **reduced risk of fragility fracture.**
- Systematic review found data mixed, though marine omega 3 acids tended to have positive effects on bone if ingested for  $\geq 18$  months with adequate calcium.
- Definite benefit for improving **muscle health.**

Longo AB, et al. *Adv Nutr* 2016; Mar 15;7(2):299-312

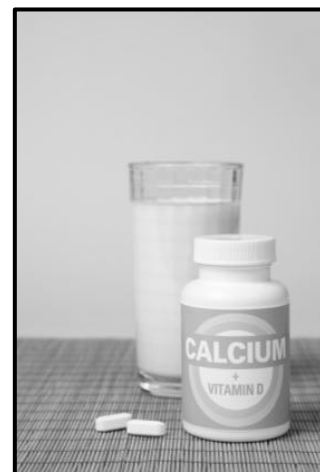
Orchard TS, et al. *Br J Nutr*. 2012;107:S253-S260

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## Calcium and Vitamin D: Fracture

- Meta-analysis by National Osteoporosis Foundation: eight studies (n= 30,970 participants) found that ***all studies showed calcium plus vitamin D supplementation produced a statistically significant 15 % reduced risk of total fractures and 30% reduced risk of hip fractures.***



Weaver CM, et al. *Osteoporosis Int* 2016; 27: 367-376.

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## Contributors to Lower Calcium

- One of first signs of calcium deficiency is muscle cramping. Long term deficiency leads to poor bone development/loss of bone mineral density, numbness and tingling in the fingers, convulsions, lethargy, poor appetite, and abnormal heart rhythms.
  - **Sodium:** high sodium intake increases urinary calcium excretion. **1,000 mg/d of calcium per 2,000 mg/d sodium to maintain balance.**
  - High **protein** intake increases calcium excretion BUT it also increases absorption, overall, a *neutral* effect.
  - **Caffeine** very modestly increases urinary excretion (**1 cup brewed coffee ~3 mg loss**)
  - **Alcohol** can reduce calcium absorption and also reduce hepatic activation of vitamin D, by how much is unknown.

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## Vitamin D and Bone

- Vitamin D deficiency associated with rickets, osteomalacia and osteoporosis.
- In children, symptoms of rickets include changes in bone (e.g., deformities of the leg), a swelling of the wrist with a widened growth gap, a delayed closure of the fontanelles, craniofacial dysmorphism and musculoskeletal pain.
- In adults, osteomalacia (reduced bone mineralization) associated with nonspecific symptoms like musculoskeletal pain, usually located in the pelvis, the shoulders or the proximal part of the muscles. Pain increased by mild pressure on sternum or anterior tibial bone are typical symptoms.

Wintermeyer E, et al. *Nutrients* 2016; Jun; 8(6): 319

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## Endocrine Society Clinical Practice Guidelines for Vitamin D

- Serum 25(OH)D level used to evaluate high-risk folks
  - Insufficiency defined as 21-29 ng/mL
  - **Deficiency defined as <20 ng/mL**
- Maximum tolerable limits for vitamin D (*without supervision*):
  - 1,000 IU/day for infants to age 6 months
  - 1,500 IU/day for ages 6 months to 1 year
  - 2,500 IU/day ages 1 to 3 years
  - 3,000 IU/day for ages 4 to 8 years
  - 4,000 IU/day anyone older than 8 years

Holick MF, et al. *J Clin Endocrinol Metab* 2011; 96(7):1911-30

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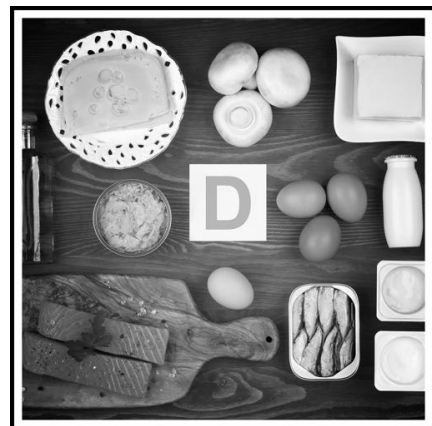
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- ~90 million Americans are vitamin D deficient using Endocrine Society guidelines
- Most individuals should take 1,000-2,000 IU vitamin D3 per day with dinner

### To get 600 IU/d Vitamin D3:

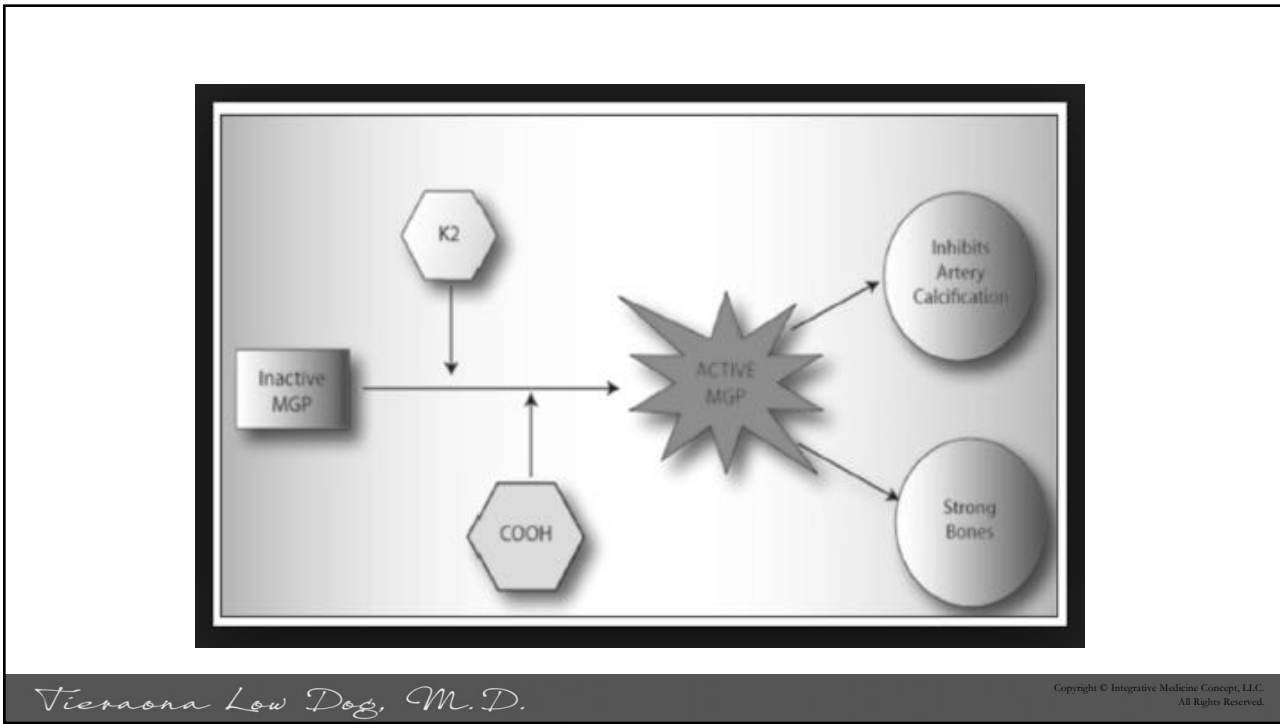
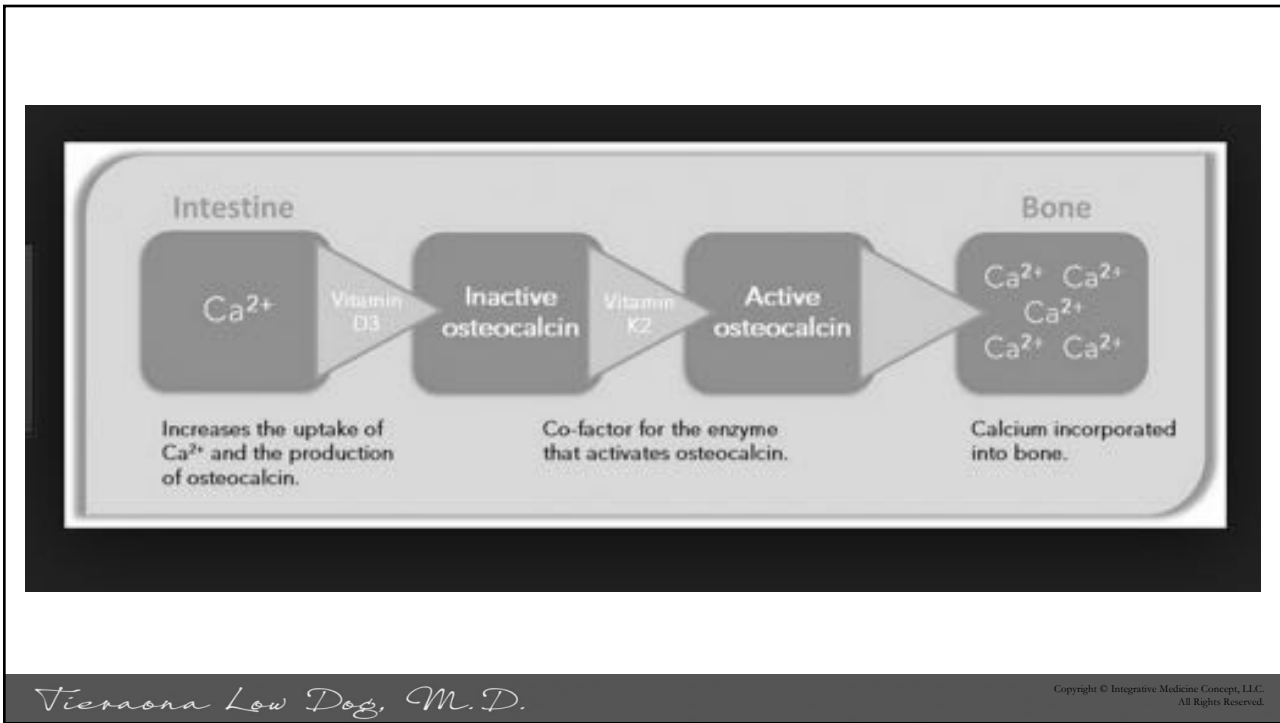
- 3-4 ounces sockeye salmon, cooked
- 11.4 ounces water-packed tuna
- 26 oil-packed sardines
- 15 large eggs
- 5 cups fortified milk
- 30-45 ounces yogurt

## Vitamin D



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## Vitamin K and Fracture

- Epidemiological studies consistently show link between higher vitamin K status and reduction of fracture risk.
- Elder men/women in highest quartile of vitamin K had 65% reduced risk of hip fracture
- Systematic review found majority of vitamin K intervention studies showed a reduction in BMD loss and improved bone biomarkers.
- 3 year trial of K2 (180 mcg/d) in postmenopausal women showed preservation of BMD in the lumbar spine and slowing of the rate of bone loss in the femoral neck.

Cockayne S, et al. *Arch Intern Med.* 2006;166(12):1256-1261.

Knapen MHJ, et al. *Osteoporosis Int.* 2013;24(9):2499-2507.

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## Summary

- The maintenance of healthy bones and muscles requires a lifetime of being physically active, consuming adequate amounts of protein, calcium, vitamins D and K, and a host of other minerals and trace minerals.
- Minimizing the risk of falls, particular as we age is a key strategy (e.g., lights in bathroom at night, removal of throw rugs, use of cane, etc.)
- Medications should strongly be considered for those with a FRAX that indicates high risk for fracture.



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# Pain

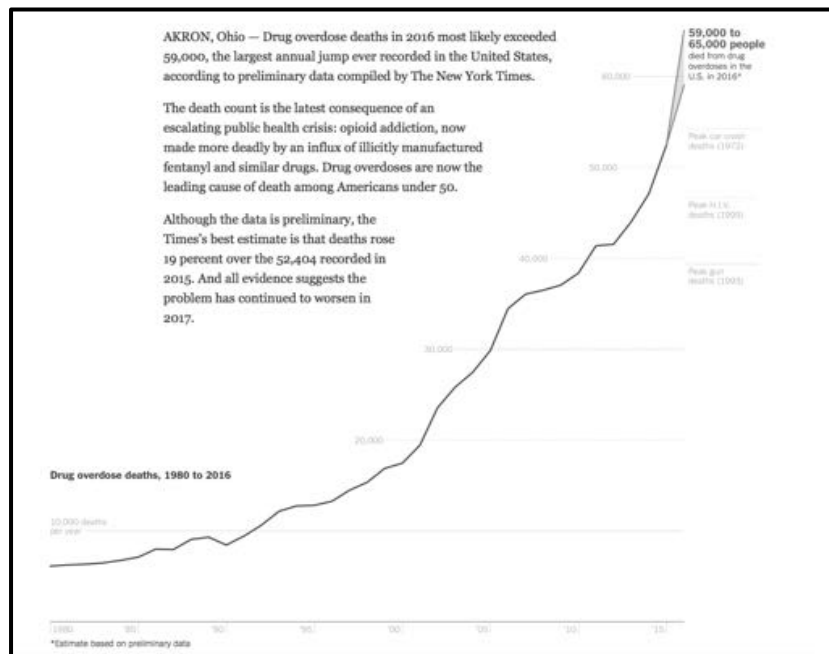


- Affects at >100 million Americans, more than those with heart disease, cancer, and diabetes combined.
- Pain costs US >\$500 billion annually in medical treatment and lost productivity.
- US accounts for ~100% of hydrocodone (*e.g.*, Vicodin) and 81% for oxycodone (*e.g.*, Percocet) used globally.
- In 2012, over 5% of U.S. population 12 yrs or older used opioid pain relievers non-medically

<http://iom.edu/Reports/2011/%20Relieving-Pain-in-America-A-Blueprint-for-Transforming-Prevention-Care-Education-Research/Report-Brief.aspx>

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“Drug Deaths in America Are Rising Faster Than Ever”  
Josh Katz, *NY Times* June 5, 2017

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## Where Are They, Where Do They Want to Go



- An integrated approach uses **all appropriate medication and/or surgical options** and moves **beyond the pain** to explore.....
  - Sleep and Rest (items discussed earlier today)
  - Work/Career (goals, impairments)
  - Diet and Food (nutritional status)
  - Relationships (status and strength)
  - Mind-Body (practices, stress management)
  - Meaning and Purpose (faith, spirituality)

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## Diet and Pain



- The role of diet is well recognized in some pain conditions:
  - Irritable bowel syndrome
  - Inflammatory bowel disease
  - Migraine (food triggers, as well as fasting induced headaches)

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## Low FODMAP Diet and GI Pain

- **FODMAP** are highly fermentable but poorly absorbed short-chain carbohydrates and polyols. Studies have shown that in some people, they can be a big cause of irritable bowel syndrome (IBS) causing gas, cramping and diarrhea.
- Studies show that by eliminating **wheat** derivatives, **lactose**-containing dairy products, **many vegetables and beans**, and several types of **fruits** can significantly improve symptoms and quality of life in those with IBS (especially diarrhea dominant) and inflammatory bowel disease.

Barrett JS. *Journal of Gastroenterology Hepatology* 2017; Mar;32 Suppl 1:8-10.

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LOW FODMAP GROCERY LIST			
Always check ingredients on packaged foods to ensure they comply with the latest low FODMAP diet guidelines.			
<b>GRAINS</b> Gluten free pasta (rice, quinoa, corn) Millet Oats Oat bran Potentia Quinoa (black, red, white) Rice (brown, white, basmati) Rice bran <b>BRAND NAME CEREALS</b> Ancient Harvest Quinoa Flakes Bob's Red Mill Hearty Tasty Hot Cereal Chex Eden Organic Brown Rice Flakes Hot Cereal Ehrenfeld's Quinoa Munch Everlasting Peanut Butter Panda Puffs <b>BREADS</b> 100% White Sandwich Bread Sourdough (white wheat, soft) Food for Life Multi Seed English muffins Millet bread Food for Life Brown Rice Tortillas Ruth's Pan Tortillas Corn tortilla <b>FLOURS AND BAKING SUPPLIES</b> Black & Gold Gluten Free Pancake and Baking Mix Dark chocolate Flour (corn, millet, quinoa, sorghum, buckwheat, rice) King Arthur GF Multi-Purpose flour Nidhi's (perfect) flour blend w/leak, pancake mix, brownie mix, blonde mix, muffin mix) Pure Maple Syrup Starch (potato, tapioca, corn) Swirl Sugar (palm, brown, granulated) <b>SPICES</b> All Spice Black pepper Cardamom Chili powder Chinese Five Spice Cinnamon Cloves Coriander Seeds Cumin Curry Powder Mustard Seeds Nutmeg Paprika Saffron Star Anise Turmeric <b>PROTEIN</b> Beef Chicken Fish Eggs Pork Lamb Tuna (canned) Tofu (firm)	<b>NUT BUTTER</b> Smucker's Peanut Butter Skippy Peanut Butter Jif Smooth Peanut Butter 363 Smooth Almond Butter (Whole) <b>NUTS/SEEDS</b> (allow one handful per sitting) Almonds Brazil nuts Chestnuts Chia seeds Macadamias Pecans Peanuts Pine nuts Poppy seeds Pumpkin seeds (pepitas) Sesame seeds Sunflower seeds Walnuts <b>PRODUCE</b> <b>VEGETABLES</b> Alfalfa sprouts Asparagus Bamboo shoots Beans (limit to 4 slices) Bell pepper Broccoli (limit to 1 cup) Bok Choy Carrots Cauliflower Cabbage (common, red) Corn (half a cob) Celeriac Celery (1/4 stalk) Chives Chili pepper Collard greens Cucumber Endive Eggplant Fennel bulb Ginger Green beans Kale Kabocha squash Leek (green leaves only) Lettuce Olives (green, black) Parsnip	Potato, white Radish Rutabaga Scallions (green part only) Spinach Sweetened (not) Summer squash Sweet potato (limit to 1/2 cup) Swiss chard Turnips Tomatoes Water chestnuts Zucchini <b>FRUIT</b> (limit to one serving per meal) Avocado (limit to 1/8) Banana (small) Blueberries Cantaloupe Coconut Clementine Dragonfruit Grapefruit Grape Honeydew melon Kiwifruit Lemon Lime Orange Papaya Passion fruit Pineapple Pumpkin Raspberries Rhubarb Starfruit Strawberries Tangerine <b>HERBS</b> Basil Cilantro Lemongrass Rosemary Parsley Tarragon <b>DAIRY</b> <b>CHEESE</b> Cheddar Swiss Colby Parmesan Goat Havarti Brie Camembert Mozzarella <b>YOGURT/KEFIR</b> Green Valley Lactose free yogurt Utervery (kefir, plain only)	<b>OILS/CONDIMENTS</b> Avocado oil Butter (sticks and spreadable) Canola oil Coconut oil Dairy blend (70% butter, 30% oil) Extra virgin and virgin olive oil Olive oil Peanut oil Rice bran oil Sesame oil Sunflower oil Vegetable oil <b>JAMS/SPREADS</b> Fish Sauce Marmalade jam Mayonnaise Miso Paste Mustard Oyster sauce Rice wine vinegar Sriracha (Cranberry Relish, Strawberry, Rhubarb Spreadable Fruit) Soy sauce <b>SNACKS+SWEETS</b> Alex's (almond, ham, cookies, peanut butter, cookies) Almond (almond) Barney Butter snack pack (smooth, raw+chia, cacao+coconut) Blue Diamond Almond Nut Thins Gilbert's (Super Duper Snickerdoodles, Sensational Sugar cookies) Gummybakes (chocolate chip love + butter+ginger love mix cookies) Justin's dark chocolate peanut butter cups Kaffee Baked Potato Chips (sea salt) Keto frozen dessert (chocolate, coconut) Laki rice crackers Lundberg Rice Chips (sea salt) Mary's Gone Crackers (organic) Rice Cakes Simply gum (mint, cinnamon, ginger) Snyder's GF Pretzels Tostitos Chips 88 Acres dark chocolate sea salt bars <b>BEVERAGES</b> Coffee Cranberry Juice (100%, containing no HFCS) Tea (black, green, peppermint, white) Water

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## Dietary Inflammatory Index

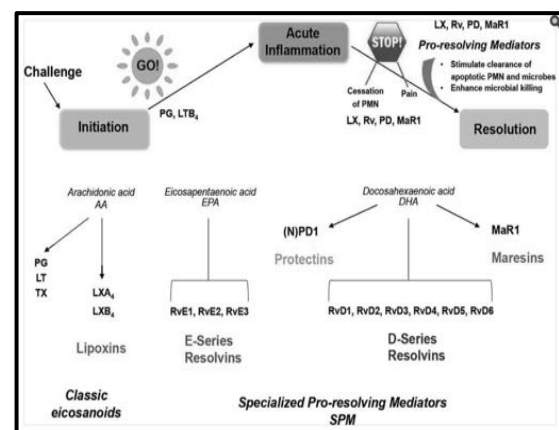
- **Inflammation** in the body is often driven by eating an anti- or pro-inflammatory **dietary** pattern. Inflammatory mediators can impact pain and mood.
- Anti-inflammatory diet shown to reduce inflammation and improve health.
- Dietary Inflammatory Index is based on measuring inflammation in the body in response to foods. It has been used in numerous published studies and is being studied for use as a clinical tool.
- The test can be downloaded as an app: ***Dietary Inflammatory Index*** (DII Screener). Patients can take the test and there is mechanism for them to submit the results to you.

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## Resolution Biology

- Research shows that resolution of inflammation is an active, programmed response.
- Omega 3 fatty acids produce specialized **pro-resolving mediators** (SPM) – resolvins, protectins and maresins.
- Increasing **omega 3 fatty acids** in the diet can help with **mood, pain and promote overall health**.

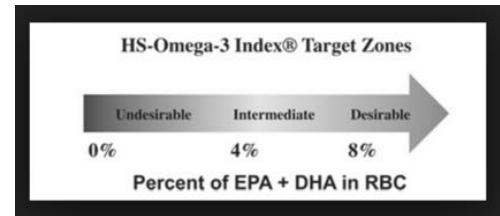


Serhan CN, Chiang N. *Curr Opin Pharmacol* 2013; 13(4):632-40

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## Canadians and Omega 3



- Omega-3 Index indicates % of EPA+DHA in red blood cell fatty acids.
- Canadian government found the mean Omega-3 Index level of Canadians aged 20-79 was 4.5%. Fewer than 3% of adults had levels associated with low CHD risk; 43% had levels associated with high risk.
- What about chronic pain patients? Should we assess omega 3 fatty acid level to optimize their “anti-inflammatory” activity?

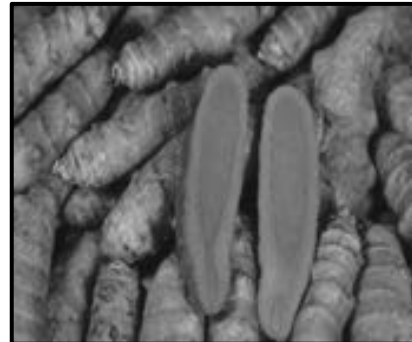
Langlois K, et al. *Health Rep* 2015; Nov 18;26(11):3-11

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## Turmeric Rhizome (*Curcuma longa* and others)

- Rhizomes provide bright yellow-orange culinary spice and dye. Yellow pigments = curcuminoids, one example is curcumin.
- Long history of medicinal use for respiratory, skin, digestive and inflammatory conditions in India. Potent **anti-inflammatory** activity.
- 13 RCTs show turmeric/curcumin at sufficient dosing and optimal preparations can **reduce pain and improve the functionality of patients with knee OA**.
- A mini **meta-analysis of 6 studies** found turmeric reduced depression symptoms, particularly in middle-aged patients when given at higher doses for longer periods of time.



Kunnumakkara AB, et al. *Br J Pharmacol* 2016; Sep 17. doi: 10.1111/bph.13621.

Prasad S, et al. *Biotechnol Adv* 2014; 32(6): 1053-1064

Chin K-Y. *Drug Des Devel Ther* 2016; 10: 3029-3042

Peddada KV, et al. *Orth Surg* 2015; 7(3):222-31

Al-Kawari D, et al. *Phytother. Res* 2016; 30(2):175-83

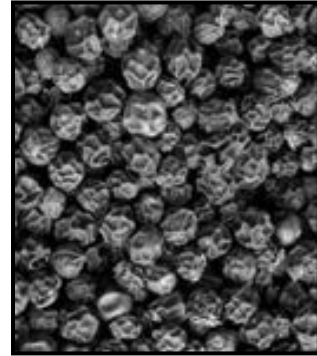
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"Cancer Prevention in 21<sup>st</sup> Century"

## Absorption and Safety Issues

- Turmeric is poorly absorbed **UNLESS** it is **nanoparticles**, bound to **phosphatidylcholine**, or includes **black pepper extract** (piperine).
- Note: Piperine causes inhibition of CYP3A4 and at doses of **20 mg can cause *clinically relevant drug interactions*** especially for drugs with narrow therapeutic indices.
- Patients on medications should be counseled about using non-piperine extracts
- Dose generally 1200-1500 mg per day of turmeric extract standardized to 95% curcumin, taken in divided doses.



Gurley BJ, et al. *Planta Med* 2012; 78(13):1490-514

Bedada SK, et al. *Drug Res* 2016; Oct 24

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## Read the Labels Carefully

Supplement Facts		
Serving Size: 1oz. Servings Per Container: 16		
	Amt. Per Serving	% Daily Value
Organic Turmeric Root Extract (Supercritical CO2 Extraction)	500mg	*
Organic Black Pepper Fruit Extract (Standardized to 95% Piperine)	10mg	*

Supplement Facts		
Serving Size: 1 Veg Capsule		
	Amount Per Serving:	% Daily Value
Curcumin Phytosome (Turmeric Root Extract (curcuma longa)/Phosphatidyl Choline Complex) (Meriva Turmeric Phytosome) (Standardized to min. 18% Curcuminoids - 90 mg)	500 mg	*
*Daily Value not established.		

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## Migraine in USA



- 30,000,000 migraine sufferers
- 1 of 4 households include a migraineur
- 9<sup>th</sup> leading disability, more common than diabetes or asthma
- Stress and poor sleep are biggest triggers for migraines, as well as dehydration, bright lights, menses, specific foods, etc.
- The following have been found effective (varying degrees) for prophylaxis:
  - Acupuncture
  - Yoga
  - Butterbur
  - Magnesium
  - Riboflavin
  - CoQ10

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## Acupuncture for Migraine

- Cochrane review 22 trials (n=4985) concluded that the available evidence shows adding acupuncture to symptomatic treatment of attacks reduces the frequency of headaches. The available trials also suggest that *acupuncture may be at least similarly effective as treatment with prophylactic drugs.*
- “Acupuncture can be considered a treatment option for patients willing to undergo this treatment.”



Linde K, et al. Acupuncture for the prevention of episodic migraine. *Cochrane Database Syst Rev* 2016; Jun 28; (6):CD001218

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## Magnesium for Migraines



Sun-Edelstein C, Mauskop A. *Clin J Pain*. 2009 Jun;25(5):446-52.

Pringsheim T, et al. *Can J Neurol Sci* 2012; 39(2Suppl) S1-S9

Chiu HY, et al. *Pain Physician* 2016; 19(1):E97-112.

- Studies show **migraineurs have low brain Mg** during migraine attacks, may have systemic low mag.
- Reduces **pediatric migraine** and tension headaches.
- Canadian Headache Society: **strong recommendation** for prophylaxis with 600 mg magnesium citrate.
- AAN/AHS gave level B recommendation (**probably effective**).
- Diarrhea most common side effect (mag glycinate and citrate less GI complaints than oxide). Caution in those with poor renal function.

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## Butterbur Extract for Migraines (*Petasites hybridus*)

- Butterbur extract has a **Level A** recommendation for migraine prophylaxis in adults (75 mg BID) from the **American Academy of Neurology and American Headache Society**.
- These recommendations may be revised (but have not) due to several cases of liver damage reported in the literature.
- Extracts must be free of pyrrolizidine alkaloids (PA). All 10 products sold in Canada are licensed and tested free of PAs.)



Rajapakse T, et al. Nutraceuticals in migraine: a summary of existing guidelines for use. *Headache* 2016; Apr;56(4):808-16.

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## Spinal Manipulation for *Acute* Back Pain

- 15 RCTS found **spinal manipulation** resulted in an improvement in pain of about 10 points on a 100-point scale.
- 12 RCTS, some of which overlapped with above but not all, found spinal manipulation resulted in **improvements in function**.



Paige NM, et al. Association of Spinal Manipulative Therapy With Clinical Benefit and Harm for Acute Low Back Pain: Systematic Review and Meta-analysis. *JAMA*. 2017;317(14):1451-1460.

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## Chronic Low Back Pain Guidance

- For patients with chronic low back pain, clinicians and patients should **initially** select non-pharmacologic treatment with *exercise, multidisciplinary rehabilitation, acupuncture, mindfulness-based stress reduction, tai chi, yoga, motor control exercise, progressive relaxation, electromyography biofeedback, low-level laser therapy, operant therapy, cognitive behavioral therapy, or spinal manipulation*.

(Grade: strong recommendation)



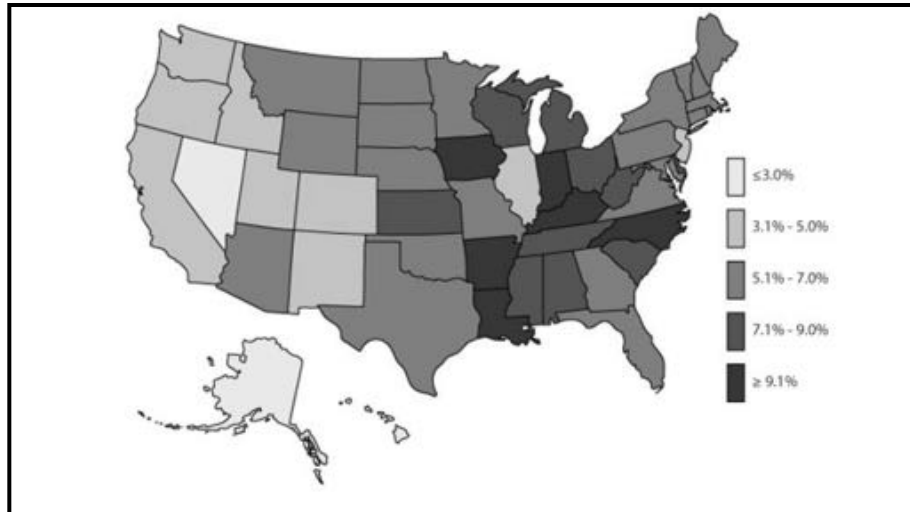
Qaseem A, et al. Noninvasive Treatments for Acute, Subacute, and Chronic Low Back Pain: A Clinical Practice Guideline From the American College of Physicians. *Annals of Internal Medicine* 2017;166(7):514-530.

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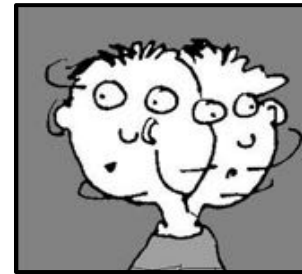
## Children on ADHD Medication (2011-12)



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## Attention Deficit Hyperactive Disorder (ADHD)



- 11% of school aged kids in US have ADHD diagnosis.
- 87% of children are prescribed medication, mostly methylphenidates (Ritalin) and amphetamines (such as Adderall). (15 have been approved for children)
- Meds can definitely improve academic performance and focus, but also can cause liver toxicity, weight loss, sleep problems, mood swings, and thoughts of suicide.
- Between \$320- \$500 million spent annually in U.S. on medications for those *inappropriately* diagnosed ADHD.

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## Multifactorial

- Everyone more stressed
- More demands on parents
- Higher demands on children
- Environmental toxins
- High carb, low nutrient diet, nutrient deficits



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- Children go to school after eating a bagel and orange juice, or sugary cereal, or pop-tarts –meals with no fat, no protein, high glycemic load.
- Blood sugar goes up and then comes crashing down. Recess and PE classes shorter, less frequent. Stress hormones, poor focus, inability to concentrate. Are we giving our children the best tools available?

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## Early Exposures

- *In-utero* and **early life exposures** contribute to neurodevelopmental disorders at doses much lower than those affecting adult brain function.
- Emerging evidence now linking exposures to **manganese, high fluoride levels, certain pesticides, flame retardants, and low maternal iodine levels** with adverse neurodevelopmental outcomes.
- Pound for pound, children drink 2.5 times more water, eat 3-4 times more food, and breathe 2 times more air.

Grandjean P, et al. *Lancet* 2014; 330–338

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## Pesticide Exposure and ADHD

- Using data from NHANES – children with **typical levels of pesticide exposure** from eating pesticide-treated fruits/vegetables, have **higher risk** of developing ADHD.
- Children ages 8-15 with higher urinary levels of dimethyl alkylphosphate (DMAP), had **twice the odds of ADHD** compared with children with low or undetectable levels.
- **Organophosphate and pyrethroid pesticide** exposure, at levels common among US children, may contribute to **ADHD** prevalence.

Kuehn BM. *JAMA*. 2010 Jul 7;304(1):27-8.

Bouchard, et al. *Pediatrics*. 2010 Jun;125(6):e1270-7.

Wagner-Schuman M, et al. *Environ Health* 2015; May 28;14:44.

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- The consumption of an **organic** diet for **one week** significantly **reduced** OP pesticide exposure in adults as measured by urinary metabolites.
- Total OP metabolites in organic phase were **89% lower** than when participants were eating conventional foods.
- Similar results have been shown in **children**.
- Unfortunately, organic produce is often more expensive than conventionally grown, making it out of reach for some of our most at risk patients.



Oates L, et al. *Environ Res* 2014; 132:105-11

Bradman A, et al. *Environ Health Perspect* 2015; 123(10):1086-93

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"If we are going to live so intimately with these [agricultural] chemicals--eating and drinking them--taking them into the very marrow of our bones—we had better know something about their nature and their power."



Rachel Carson,  
*Silent Spring*

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## Nature

Could nature also hold the key, at least in part, for children who are living with attention deficit hyperactive disorder (ADHD)?



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- Meditation interventions are being increasingly implemented among youth in school, community, and clinic based settings
- Review of **16 studies** found that meditation can be an effective intervention for **psychosocial and behavioral** problems among children and adolescents.

Black DS, et al. *Pediatrics* 2009; 124(3):e532-41

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## Neurofeedback



- **104 children** (7-11 years) with ADHD randomly assigned to receive in school 40-session computer training intervention: **neurofeedback, cognitive training, or control group** and evaluated **six months** post-intervention.
- **Neurofeedback** participants made more **prompt and greater improvements in ADHD** symptoms, which were sustained at the 6-month follow-up. Cognitive training and control groups both had increased medication dosing during follow up.

Steiner NJ, et al. *Pediatrics* 2014; 133(3):483-92

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## A Nation On The Edge?



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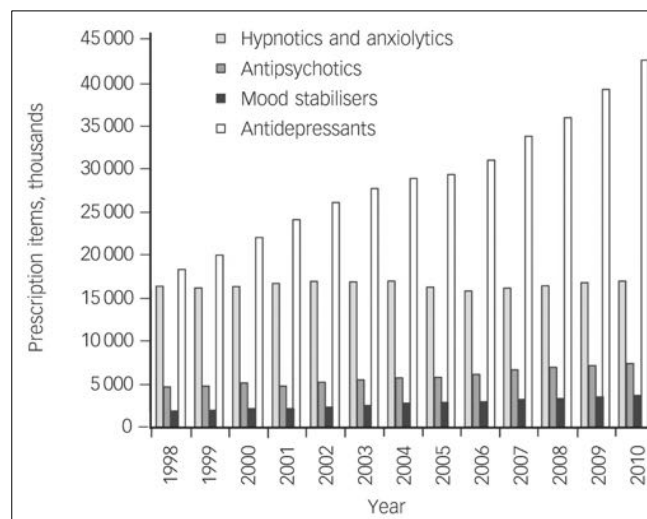
- According to CDC, **11% of Americans** 12 and older take **anti-depressant** medications:
  - **400% increase** from the 1980s, ~270 million prescriptions per year.
- **1 in 4** women 40-60 years take anti-depressants.
- **Anxiety** disorders in ages 9 - 17 is **13%**.
- **1 in 8** adolescents have major **depression**.
- **Over-diagnosis** and **overtreatment** of mental disorders is of particular **concern**: diagnostic decisions based mostly on patient **self-report**, not on **objective signs** or **laboratory tests**.



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### Trends in prescriptions of major classes of psychiatric drugs 1998–2010.



Stephen Ilyas, and Joanna Moncrieff BJP 2012;200:393-398

THE BRITISH JOURNAL  
OF PSYCHIATRY

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- 74 FDA-registered studies, 31% not published. Published literature, **94% of trials** were positive. FDA analysis showed that **only 51%** were positive.
- JAMA review: The magnitude of benefit for antidepressant medication compared with placebo may be **minimal or nonexistent**, on average, in patients with **mild or moderate** symptoms.
  - For patients with very **severe depression**, the **benefit of medications over placebo is substantial**

Turner, et al. *NEJM* 2008 Jan 17;358(3):252-60

Fournier, et al. *JAMA*. 2010;303(1):47-53

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## Grief as Major Depression



- The new draft of the DSM 5 considered the diagnosis of Major Depression even if the person is grieving immediately after the loss of a loved one.
- Many people now considered to be experiencing a variation of normal grief would have received a mental disorder diagnosis.
- How many grieving individuals would have received the diagnosis, especially once pharmaceutical companies started marketing and raising awareness?

<http://www.dsm5.org/Pages/Default.aspx>

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**Oh what to do, what to dooo???**

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## State of Our Nutrition

- 90 million Americans are vitamin D deficient using Endocrine Society guidelines of  $<20$  ng/mL
- 30 million are deficient in vitamin B6
- 18 million people have B12 deficiency
- 16 million have vitamin C deficiency
- 13% of Latinas, 16% of African American, and 8% of white women (ages 12-49) are iron deficient
- Women 25-39 borderline iodine insufficiency
- 50% Americans don't meet RDI for magnesium

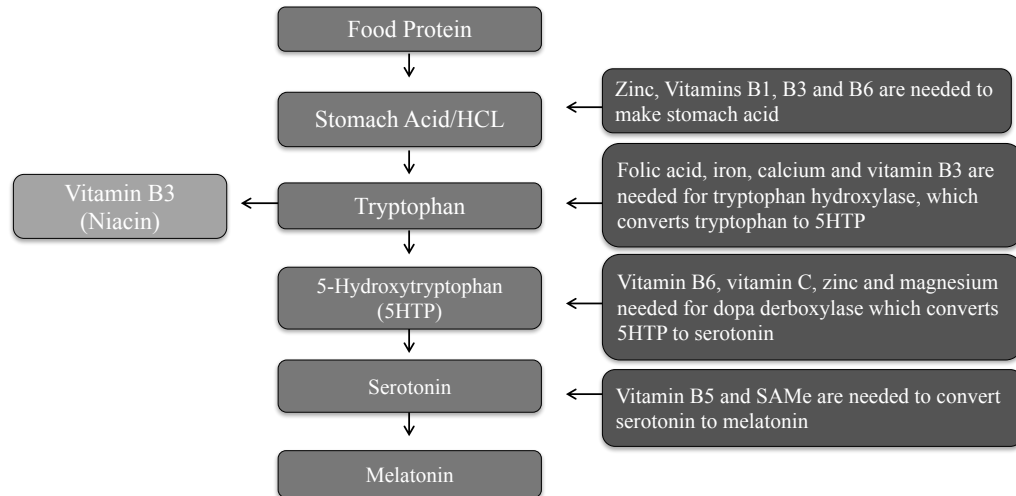


*CDC: 2<sup>nd</sup> National Report on the Biochemical Indicators of Diet and Nutrition in the U.S. population*

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## Serotonin and Melatonin Pathways



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## Two Vitamin B Deficiencies

- **30 million** Americans deficient in vitamin **B6** PLP < 20nmol/L)
  - **NSAIDs** and **OCPs** interfere with B6 metabolism.
  - Deficiency: **depression**, decreased **attention**, **energy** and **sleep**.
- **18 million** Americans deficient in vitamin **B12**.
  - Key for healthy **neurologic function and mood**
  - Risk for deficiency: taking metformin (also PPIs), inadequate intake, poor absorption, increasing age

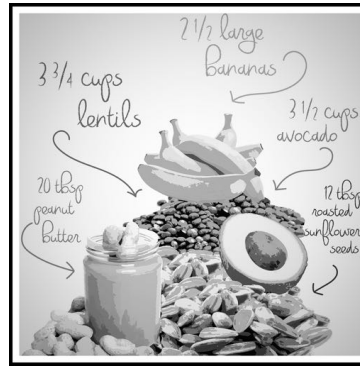
*CDC 2<sup>nd</sup> National Report on Biochemical Indicators of Diet and Nutrition in the U.S. Population*

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## To Get 1.5mg of B6 in Food

- 2.5 bananas
- 12 Tbsp. roasted sunflower seeds
- 8 ounces chicken breast
- 8 ounces sockeye salmon
- ~5 ounces cooked tuna
- ~5 ounces beef liver
- 3.5 cups raw diced avocado
- 3 cups sweet potatoes
- 15 cups of milk OR
- 20 Tbsp. peanut butter



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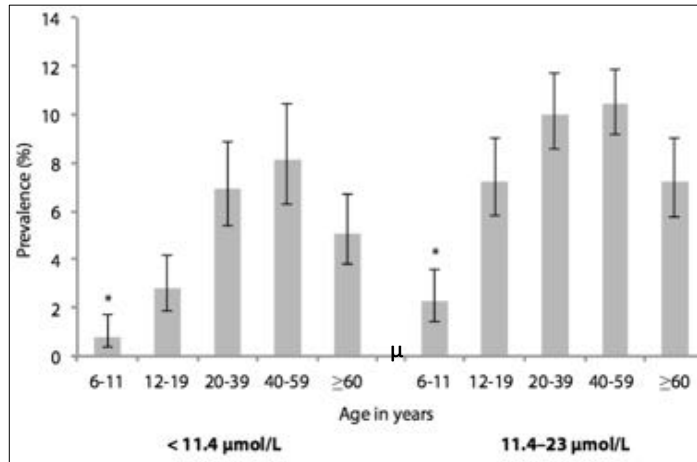
## Vitamin C

- Potent antioxidant, activates **folate**, needed to convert tryptophan to **serotonin**, cofactor in synthesis of **carnitine**, **thyroxine**, **norepinephrine**, **dopamine** and proper function of immune cells
- Vitamin C levels **decline rapidly** during periods of **emotional and physical strain**, and illness.
- As levels fall, collagen synthesis impaired: bruise more easily, skin becomes thick and dry, wounds take longer to heal, joints hurt, fatigue, depressed mood.
- Recommend 200 mg 1-2 times daily if under high stress and/or low intake of fruits/veggies



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**Figure H.1.f.** Prevalence estimates of vitamin C deficiency (serum concentrations less than 11.4 µmol/L) and low vitamin C concentrations (11.4-23 µmol/L) in the U.S. population aged 6 years and older by age group, National Health & Nutrition Examination Survey, 2003-2006.

Error bars represent 95% of confidence intervals. \*Prevalence in children is significantly lower than prevalence in persons 20 years and older ( $p < 0.05$ ).

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## Menstruation, Pregnancy and Iron

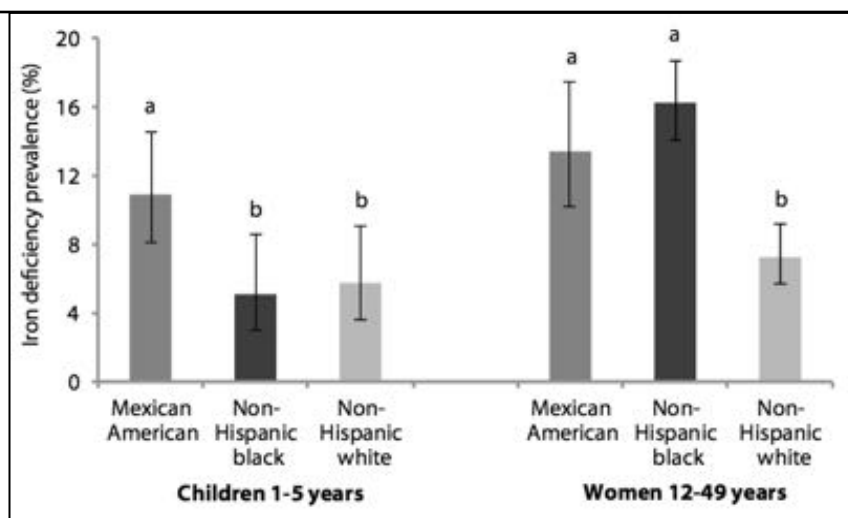
- Low iron levels *are the most common cause of anemia* in adolescent girls and can be very detrimental to **mood and cognition**, as well as **physical well-being**.
- Heavy menstrual bleeding is a significant risk for iron deficiency and is often overlooked.
- If a pregnant woman does not get enough iron, her baby is at higher risk for being *born prematurely with a low birth weight, lower IQ and poorer neurocognitive development*.



Blitzer J, et al. *Gynecol Endocrinol* 2014;30(8):542-8.  
 Nelson AL, et al. *Am J Obstet Gynecol* 2015; 213(1):97.e1-6.  
 Cooper M, et al. *Health Rep* 2012;23(4):41-8.

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**Figure H.3.a.** Age-adjusted prevalence estimates of low body iron stores (<0 mg/kg) in U.S. children and women by race/ethnicity, National Health and Nutrition Examination Survey, 2003-2006.

Error bars represent 95% of confidence intervals. Bars are not sharing a common letter differ within children and women ( $p < 0.05$ ). Age adjustment was done using direct standardization.

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## To Get 18mg of Iron in Food

- 4 cups of raisins
- 3-5 cups instant oatmeal
- 3 cups Special K cereal\*\*
- 3 cups cooked lentils
- 2.2 cups canned white beans
- 10 ounce beef liver
- 45 ounce chicken breasts
- 15 cups broccoli OR
- 3 cups cooked spinach



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## Exercise and Mental Health



- The relationship between physical activity and mental health has been widely investigated and has been shown to **reduce the harmful effects of stressors** when performed at moderate intensities.
- 92 studies 4,310 participants for effect of physical activity on depression; 306 study effects with 10,755 participants for effect on anxiety concluded: **physical activity reduces depression and anxiety.**

*Deslandes, et al. Neuropsychobiology 2009; 59(4):191-8*

*Rebar AL, et al. Health Psychol Rev 2015; Mar 5:1-78*

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## Mindfulness Meditation



- Long-time meditators have greater activation of areas responsible for sustaining **attention**, processing **empathy**, **integrating emotion and cognition**, and perceiving the mental and emotional state of others.
- Review of **47 trials** found meditation improves:
  - **Anxiety**
  - **Depression**
  - **Pain**

*Goyal M, et al. JAMA Intern Med 2014; 174(3):357-68*

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## Loneliness, Social Isolation & Health



- 148 studies found social isolation is:
  - As bad as smoking 15 cigarettes a day.
  - As dangerous as being an alcoholic.
  - As harmful as never exercising.
  - Twice as dangerous as obesity.

Cacioppo JT, et al. *Ann N Y Acad Sci* 2011; 1231:17-22

Holt-Lunstad J, et al. *PLoS Med* 2010; 7:e1000316

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NATIONAL  
GEOGRAPHIC

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*“There are voices which we hear in solitude ...*

*but they grow faint and inaudible as we enter into the world.”*

*Ralph Waldo Emerson*

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## The World Today

- We have strongly emphasized the **biological explanation** for depression and anxiety in modern times, as evidenced by the extensive use of antidepressants and anxiolytics. Serotonin and norepinephrine reuptake inhibitors dominate the scene.
- There remains **little** focus on the **physiological, nutritional, societal, communal, familial and spiritual underpinnings of depression.**
- “I take my Effexor and go to a **job I hate** and then home to a house full of **kids** that are **out of control** and a husband that barely talks to me. Is my depression better? Yea, I guess.”
- **Complex and confusing world.** We have unrealistic expectations. **Isolation** is common, **financial problems, lack of purpose, meaning, a sense of despair, hopelessness – the world has less color and texture.**

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## *Healing.....*

*“Healing may not so much be about getting better, but about letting go, of all the expectations, all of the beliefs, and becoming who you are.”*

— Rachel Naomi Remen, M.D.



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Patient: Doctor, I don't feel well and I'm not sure why.



Doctor: I want you to meditate for 20 minutes, twice a day, exercise for at least 30 minutes a day, avoid processed foods, eat plenty of organic fruit and veg, spend more time in nature and less indoors, stop worrying about things you can't control and ditch your T.V. Come back in 3 weeks.

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