

# Optimizing Musculoskeletal Health

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FOOT & ANKLE TEAM  
HQE2

**MyBONe**

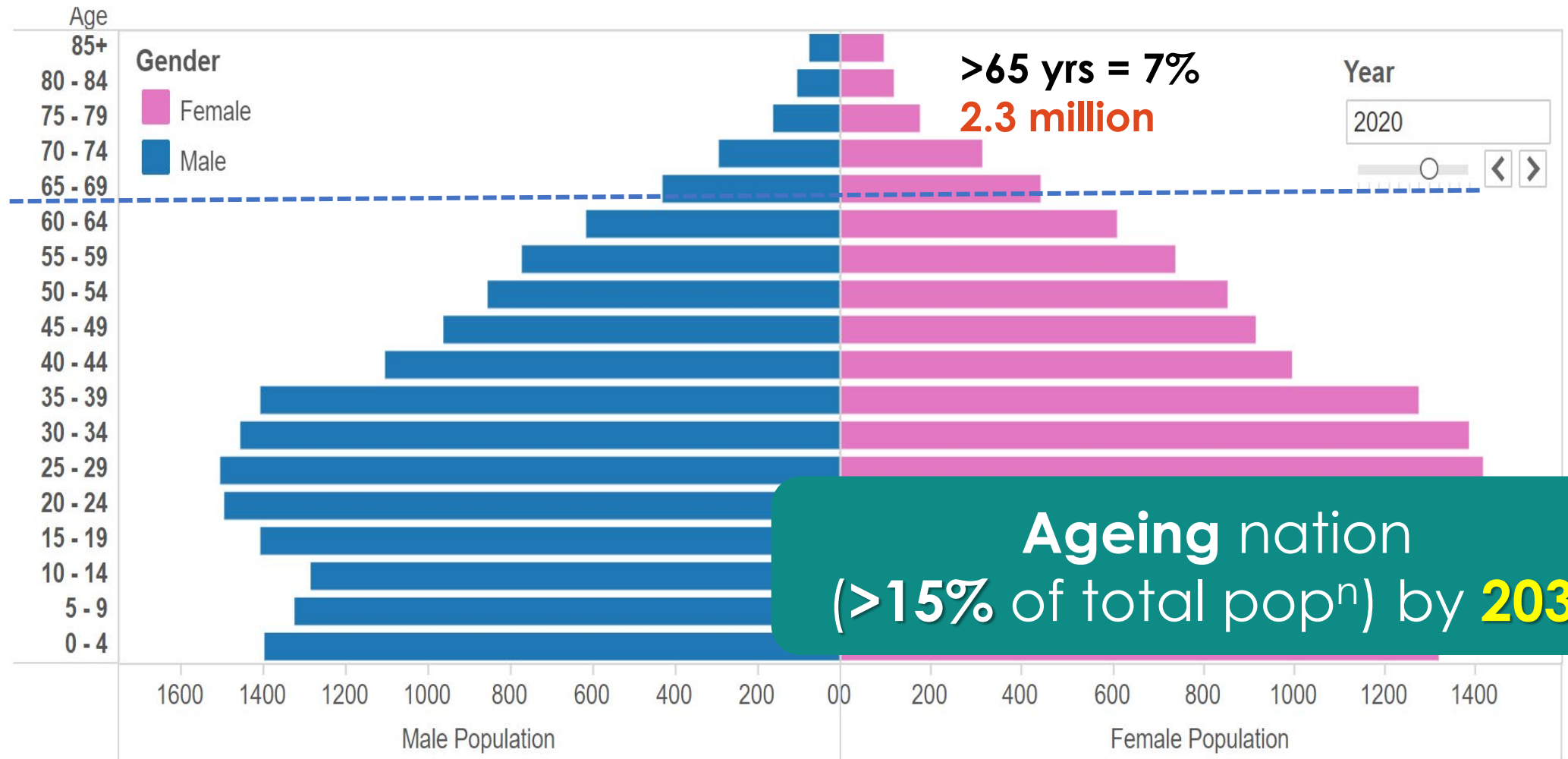
Malaysian Bone-health Optimization Network  
Persatuan Rangkaian Optimisasi Kesihatan Tulang Malaysia



# Aging



# Malaysian Age Pyramid (2020)





- Skeleton
- Joints
- Muscle



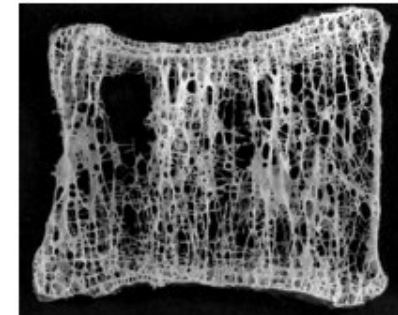
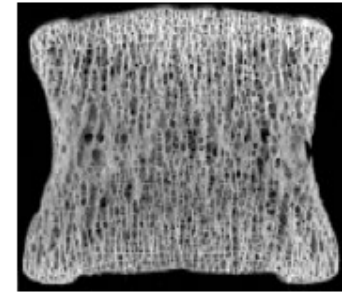


# Aging Changes



- People lose bone mass or density as they age, especially women after menopause. The bones lose calcium and other minerals.

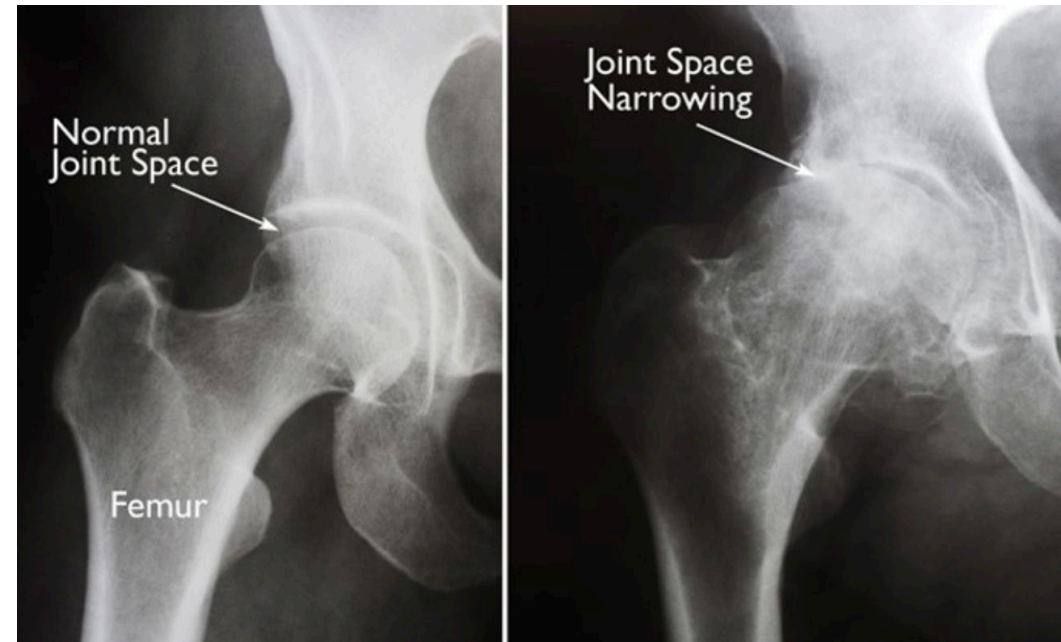
Normal



Osteoporosis



- The joints become stiffer and less flexible. Fluid in the joints may decrease. The cartilage may begin to rub together and wear away
- Hip and knee joints may begin to lose cartilage (degenerative changes)





- Lean body mass decreases.
- Muscles may become rigid with age and may lose tone, even with regular exercise





# Common Problems

- Osteoporosis
- Muscle problems
- Joint problems



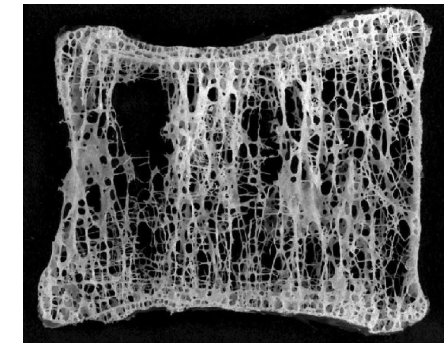
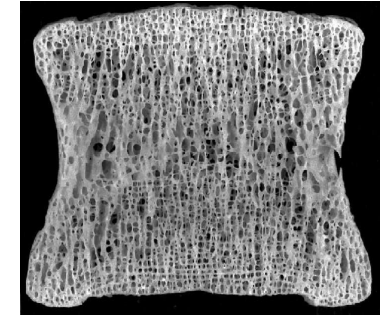
# Osteoporosis – definition

Osteoporosis is defined as a skeletal disorder characterized by **compromised bone strength** predisposing a person to an **increased risk of fracture**

Bone strength reflects integration of

- **bone quantity**
- **bone quality**

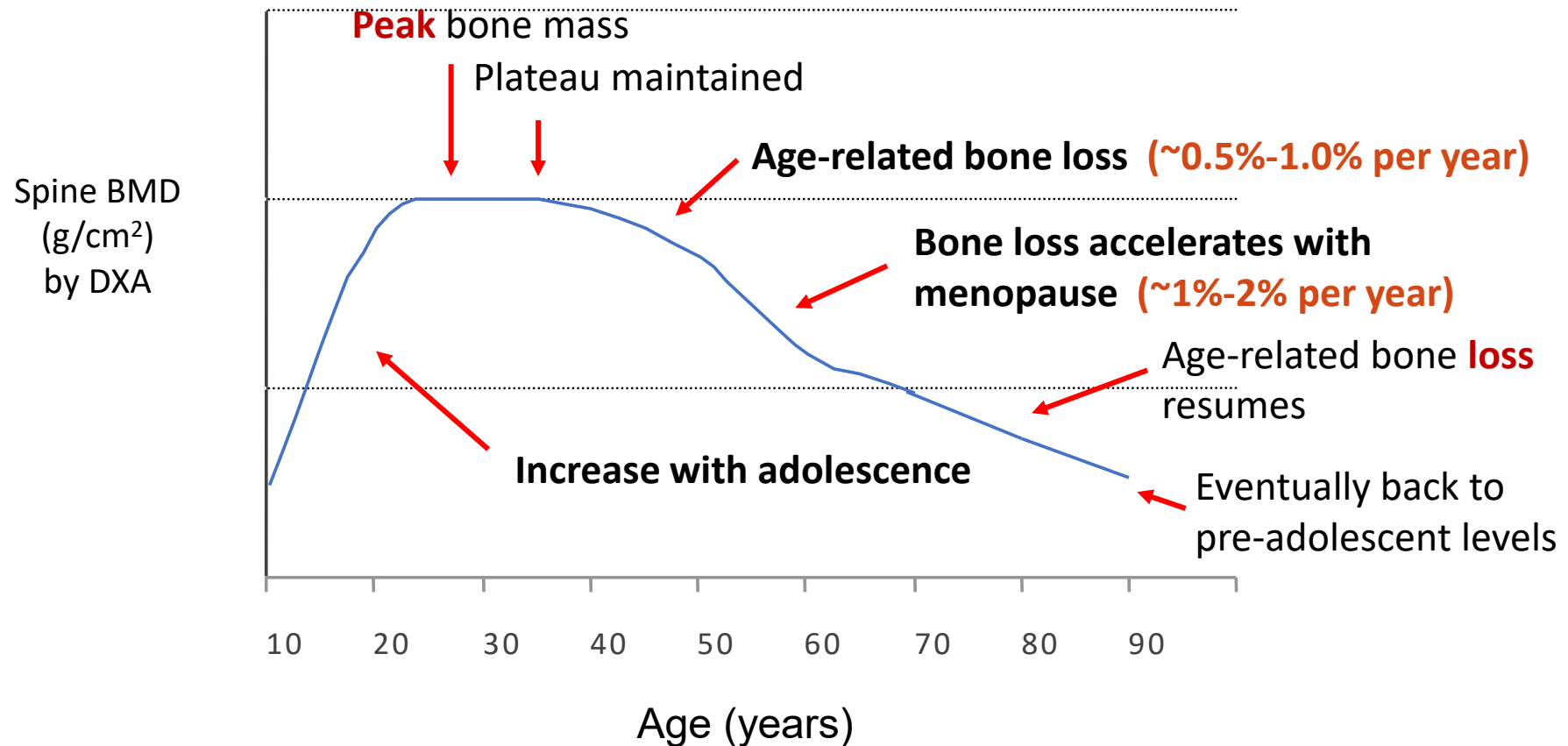
Normal



Osteoporosis

# Changes in Bone Density with Age

## Example of BMD Change at the Spine in Women





# Osteoporosis: **No Clinical Manifestations** until a **Fracture** happens



**1 in 5 men** over age 50 will suffer from a fracture<sup>1</sup>



**1 in 3 women** over age 50 will suffer from a fracture<sup>1</sup>

By the year 2050, **50%** of all hip fractures in the world are projected to occur in **Asia**<sup>3</sup>



1. Sözen T, et al. *Eur J Rheumatol*. 2017;4(1):46–56. 2. International Osteoporosis Foundation. Gaps and Solutions in Bone Health A Global Framework for Improvement. Available at: <https://share.osteoporosis.foundation/WOD/2016/thematic-report/2016TR-key-messages.pdf>. Accessed on: 06 October 2021. 3. Cheung EYN, et al. *Osteoporos Sarcopenia*. 2016;2(3):118–133.

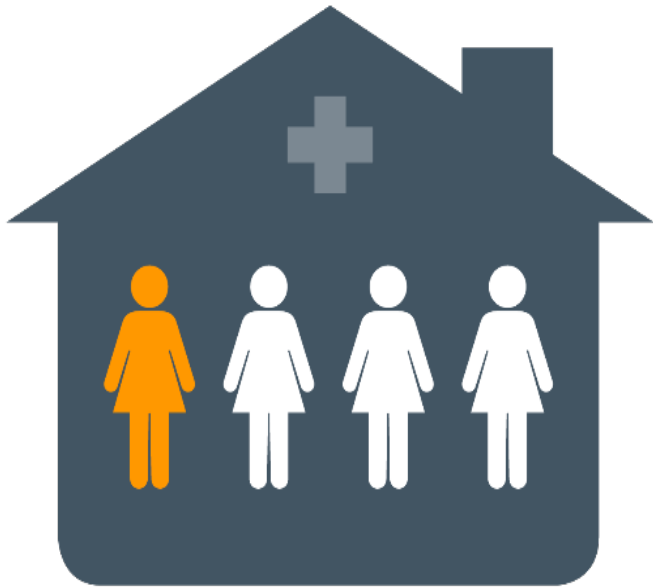


Global Statistics

# Hip Fracture due to Osteoporosis → Devastating to the Lives of patients



**1 in 3** women unable to walk without assistance 2 years post-fracture<sup>1</sup>



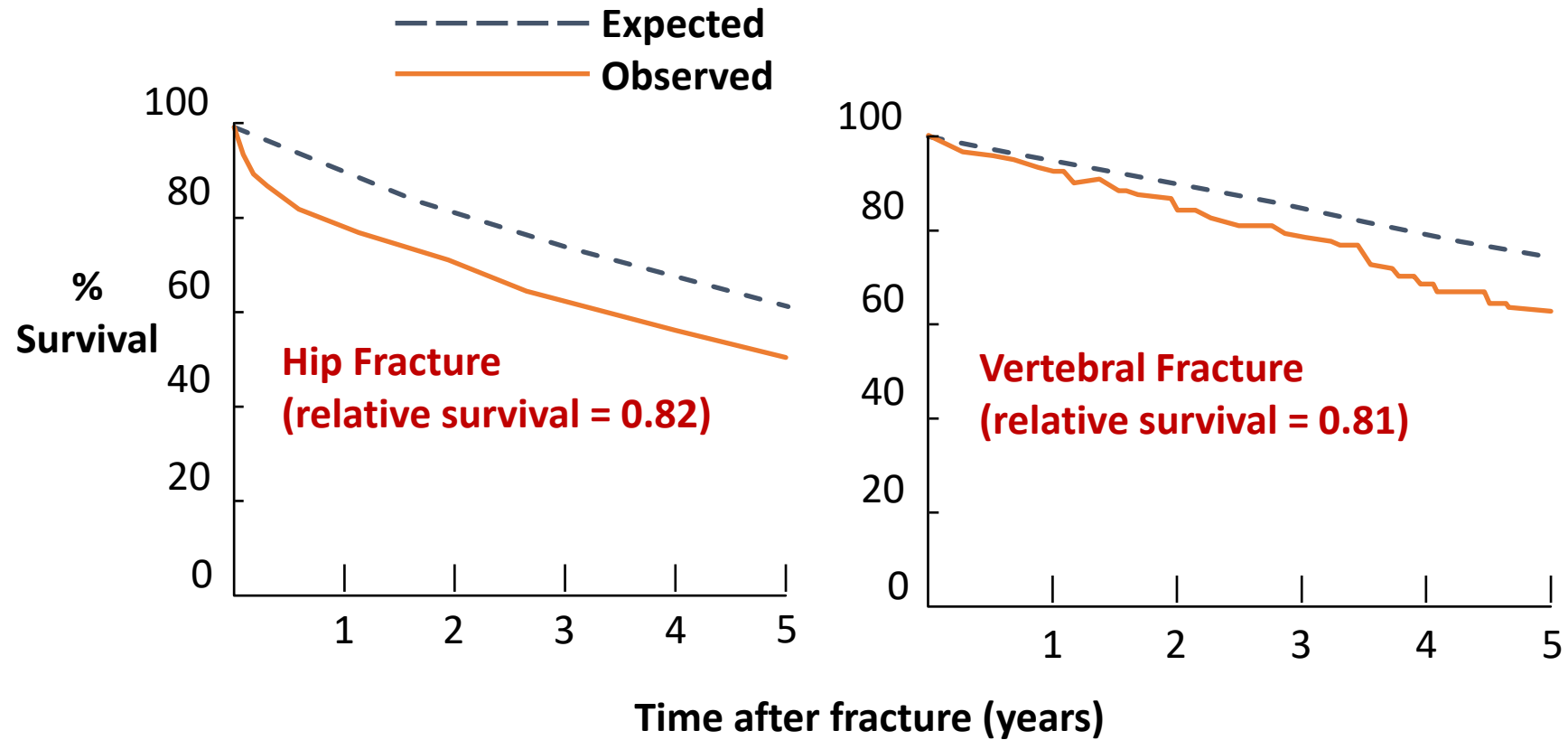
**1 in 4** likely to go to a nursing home<sup>2</sup>



**1 in 4** women likely to die within 12 months<sup>3</sup>

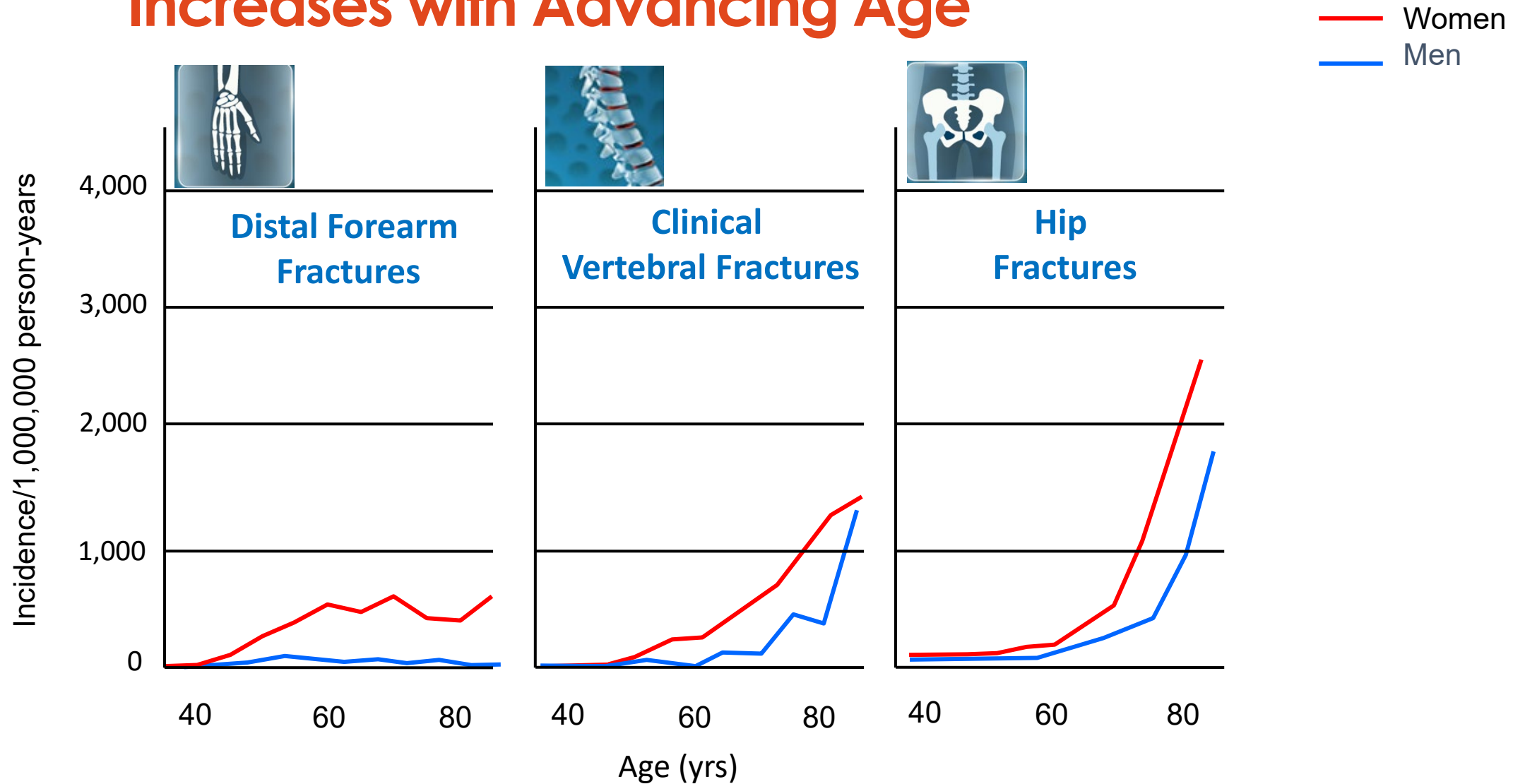
1. Magaziner J, et al. *J Gerontol A Biol Sci Med Sci*. 2000;55:M498–507. 2. Leibson CL, et al. *J Am Geriatr Soc*. 2002;50:1644–50. 3. IOF. The Asia-Pacific regional audit. 2013.

# Survival is Decreased After Fracture



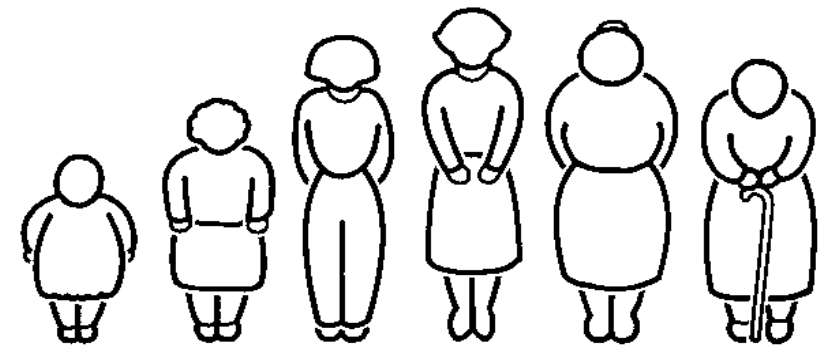
Adapted from Cooper C, et al. *Am J Epidemiol.* 1993;137:1001. © Johns Hopkins University School of Hygiene and Public Health, used with permission

# Incidence of Osteoporotic Fractures – Increases with Advancing Age



Adapted from Cooper C et al. *Trends Endocrinol Metab.* 1992;3:224

# PREVENTION OF OSTEOPOROSIS



**4.1 Nutrition** 4.1.1 Calcium & Vitamin D

4.1.2 Body weight

4.1.3 Caffeine intake

4.1.4 Smoking

4.1.5 Alcohol

**4.2 Exercise** 4.2.1 Exercise for prevention of fractures

4.2.2 Exercise for prevention of falls



# NUTRITION

## Recommendation

- Adequate calcium and vitamin D is important for peak bone mass attainment and osteoporosis prevention in adults and postmenopausal women

***Grade A***

- Increasing **calcium** intake (dietary sources or supplements) has small non-progressive effects on BMD in adults and post-menopausal women.
- Calcium supplements increased BMD by 0.7-1.8% in 1 year <sup>57</sup>(Level 1++)
- Calcium is considered a threshold nutrient which do not confer additional benefits on BMD when recommended levels are obtained

**Table 4-1. Recommended Nutrient Intake**  
**– calcium and vitamin D according to age and sex**

	<b>Age</b>	<b>Calcium</b> (mg)	<b>Vitamin D</b> µg (IU)
<b>Men</b>	19-65 years	<b>1000</b>	<b>15 (600 IU)</b>
	>65 years	<b>1000</b>	<b>20 (800 IU)</b>
<b>Women</b>	19-49 years	<b>1000</b>	<b>15 (600 IU)</b>
	50-65 years	<b>1200</b>	<b>15 (600 IU)</b>
	>65 years	<b>1200</b>	<b>20 (800 IU)</b>

## Table 4-2. Calcium content of some common foods



Food	Calcium content (mg)
1 glass of high calcium milk (200 ml)	500
1 glass of skimmed milk (200 ml)	250
1 glass of full cream milk (200 ml)	220
1 cup of yoghurt (150 g)	200
1 piece tofu (150 g)	200
1/2 cup of yellow dhal (100 g)	170
1 cup of spinach (56 g)	160
1 cup of ice-cream (156 g)	150
1 cup watercress (sai-yong choy) (50 g)	100
1 piece of cheddar cheese (20 g)	100
1 cup of mussels (160 g)	100
1/2 cup of ikan bilis (dried without head & entrails) (20 g)	100
1 piece of canned sardine (40g)	100
1 cup of baked bean (240 g)	100
1 cup of mustard green (sawi), cekur manis, kai lan or pucuk ubi kayu (50 - 80 g)	100
1 piece of tempeh (70 g)	50
1 cup of soyabean milk (200 ml)	40
1 cup of broccoli (95 g)	40
10 almonds (15 g)	30

\* 1 cup = 200 ml

## Recommendation

- Vitamin D supplementation (800 IU/day) + Calcium (1200 mg/day elemental calcium) is recommended for fracture and fall prevention
- In people > 50 yrs of age who are at risk of fracture
- Particularly when initiating active osteoporosis therapies

# Calcium + Vitamin D in Osteoporosis

- Medications for osteoporosis trials were performed in the context of calcium + vitamin D repletion (ie. subjects in the trials had Cal + Vit D supplemented)
- Evidence supports → calcium + vit D supplementation in treatment of osteoporosis in people >50 yrs of age <sup>217</sup> (Level 1)

## Evidence for **Calcium + Vitamin D** in Osteoporosis

- Leads to modest reduction in fracture risk especially those at highest risk of calcium and/or vitamin D deficiency – based on one large meta-analysis <sup>226</sup> (Level 1++)
- Among institutionalised and community dwelling older adults, calcium + vitamin D supplementation <sup>56</sup> (Level 1++)
  - total fractures**    ↓ 15% (RR estimate **0.85** (95% CI 0.73,0.98))
  - hip fractures**     ↓ 30% (RR estimate **0.70** (95% CI 0.56, 0.87))

## Evidence for **Vitamin D** in Osteoporosis

- Adequate vitamin D could reduce falls in elderly, indirectly influences the risk of fracture. Effect through improvement of muscle strength, gait, & balance <sup>221</sup> (Level 1+)

226 DIPART Group *BMJ* 2010;340:b5463

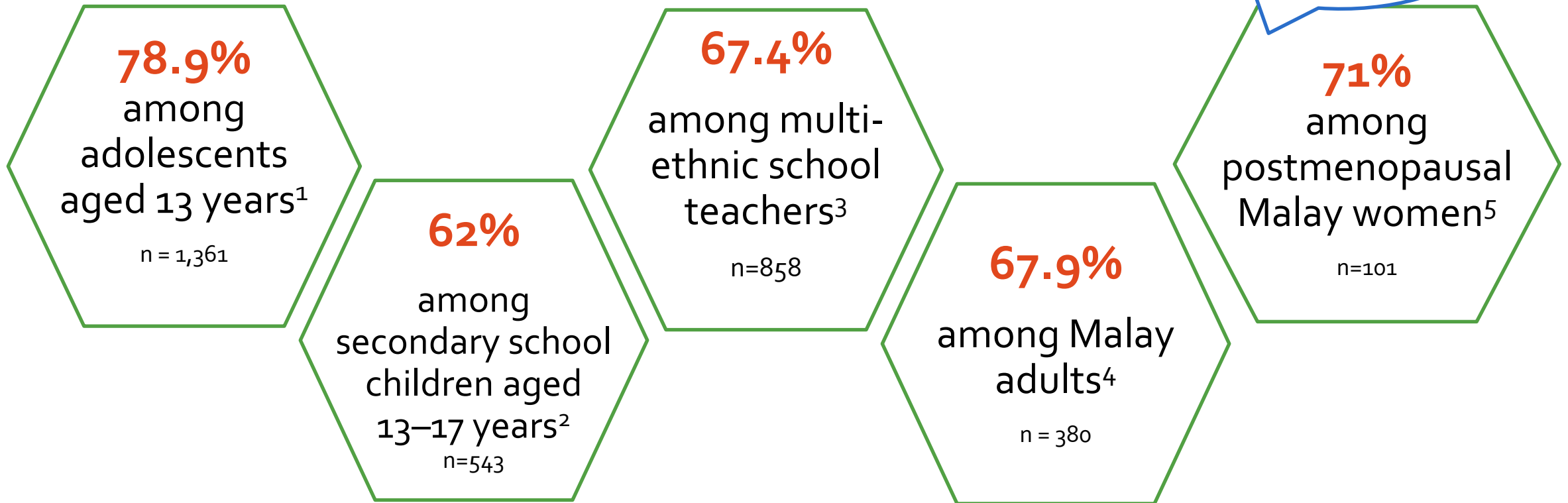
56 Weaver CM et al *Osteoporosis international* 2016 Apr;27(4):1281-386

221 Thanapluetiwong S et al. *Medicine* 2020;99(34\_ e21506-221506

# Prevalence of **Vit D Deficiency** in MALAYSIA

- Vitamin D Deficiency in Malaysia is **HIGH**

**WHY??**



1. MyHeART study group. BMJ Open 2016; 6: e010689. 2. Samingan N et al. Int J Pediatr Endocrinol. 2015 (Suppl 1):O50. 3. Shafinaz IS et al. BMC Public Health. 2016;16:232

4. Moy FM. J Photochem Photobiol B. 2011; 104 (3): 444-8. 5. Rahman SA et al. Asia Pac J Clin Nutr. 2004; 13 (3): 255-60.



# Vitamin D

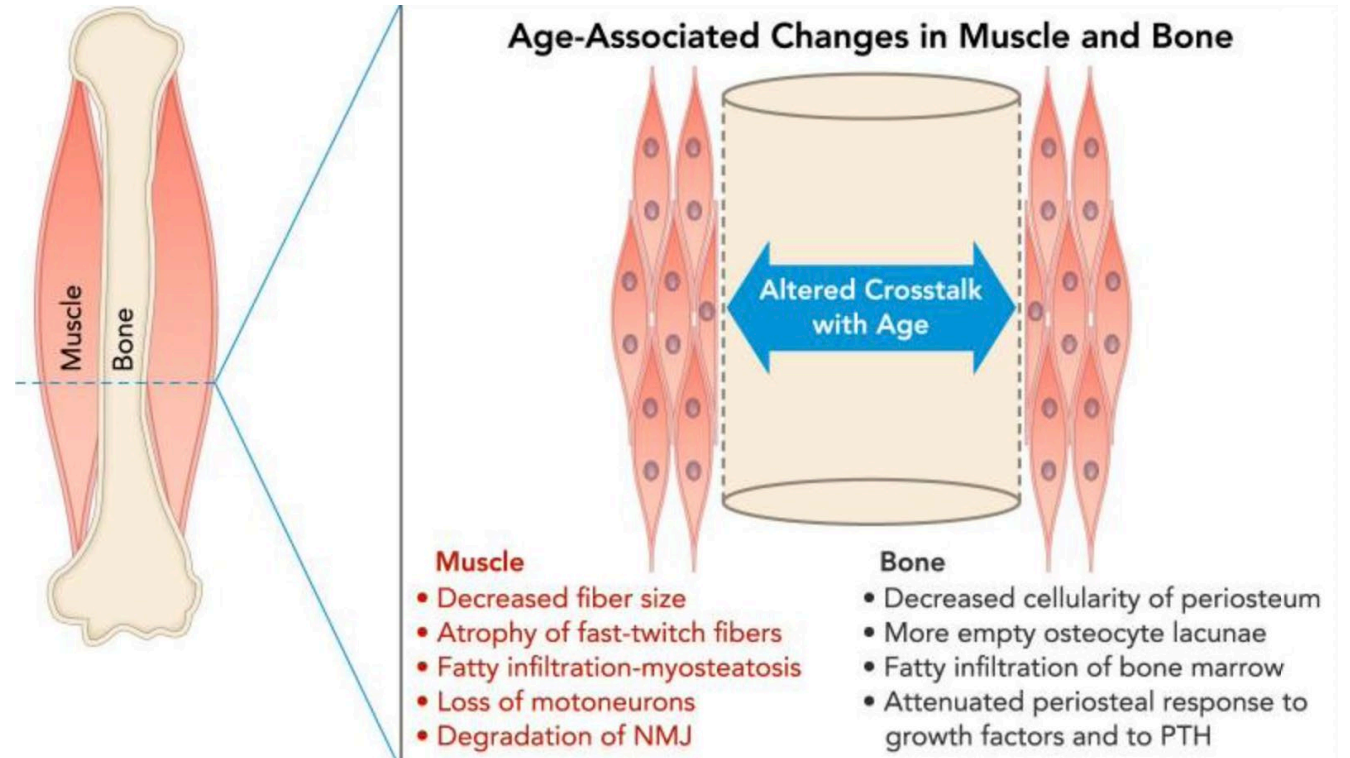
- Vitamin D is made in the skin when the skin is exposed to UV-B rays in sunlight
- Only a limited number of foods contain vitamin D
- exposing the skin to sunlight is how we get 70-80% of the vitamin D our body needs

## How much **SUN EXPOSURE** do you need?

- generally, 10–20 minutes of sun exposure to your bare skin (face, hands, and arms)
- outside peak sunlight hours (before 10 AM and after 2 PM) daily – without sunscreen – and taking care not to burn

# Common Problems

- Osteoporosis
- **Muscle problems**
- Joint problems



## Recommendations

- Regular physical activity, in particular weight-bearing exercise is encouraged in all age groups to maximise peak bone mass, decrease age-related bone loss, maintain muscle strength and balance **Grade C**

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- Exercise and physical therapy are recommended to prevent falls and injuries from falls **Grade A**

# Prevention

- Exercise is one of the best ways to slow or prevent problems with the muscles, joints, and bones. A moderate exercise program can help you maintain strength, balance, and flexibility. Exercise helps the bones stay strong.



## Benefits of EXERCISE

- Regular exercise, in particular weight-bearing exercise
- (eg. brisk walking and line dancing) is encouraged in all age groups in order to
  - - maximise peak bone mass
  - - decrease age-related bone loss
  - - maintain muscle strength and balance<sup>73-75</sup>

**[Grade D, Level 4]**

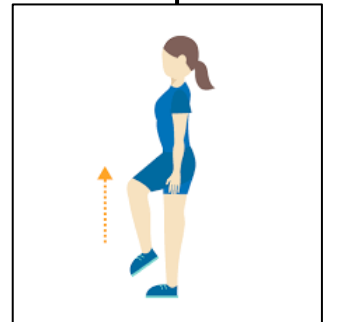
73.de Kam D, Smulders E, Weerdesteyn V, Smits-Engelsman BC. *Osteoporos Int.* 2009;20(12):2111-2125.

74.Iuliano-Burns S, Saxon L, Naughton G, Gibbons K, Bass SL. *Bone Miner Res.* 2003;18(1):156-162.

75.Magkos F, Kavouras SA, Yannakoulia M, Karipidou M, Sidossi S, Sidossis LS. *Clinical Journal of Sport Medicine.* 2007;17(2).

## EXERCISE for FALLS PREVENTION

- Multiple exercise component interventions (i.e. combining  $\geq 2$  categories of exercise) have shown to reduce rate of falls beyond 12 months<sup>77,78</sup>
- Interventions with a total weekly dose of  $>3$  hours<sup>77,82</sup> that included
  - - balance
  - - functional
  - - resistance exercises
- were particularly effective in reducing the rate of falls<sup>82,83</sup>



77. Sherrington C, Fairhall N, Kwok W, et al. *Int J Behav Nutr Phys Act.* 2020;17(1):144.

78. Finnegan S, Seers K, Bruce J. *Physiotherapy.* 2019;105(2):187-199.

82. Sherrington C, Michaleff ZA, Fairhall N, et al. *Br J Sports Med.* 2017;51(24):1750-1758.

83. Sherrington C, Fairhall NJ, Wallbank GK, et al. *Cochrane Database Syst Rev.* 2019;1(1):Cd012424.

## EXERCISE for FALLS PREVENTION

- **No difference** in the effectiveness of exercise on the rate of falls whether the intervention was delivered in a **group setting** or to an **individual** alone.<sup>83</sup>
- Current evidence is unable to make recommendation of one form of exercise over another to reduce the risk of falls and fractures.

# EXERCISE REDUCES RISK OF FRACTURE

- Exercise has also been shown to **reduce** the likelihood of sustaining a **fracture by 26- 46%**.<sup>80,83,84</sup>
- These studies included either elements of
  - **resistance or strength training**
  - **gait and balance exercise**
  - **weight-bearing component**



80. Wong RMY, Chong KC, Law SW, et al. *J Orthop Translat.* 2020;24:58-65.

83. Sherrington C, Fairhall NJ, Wallbank GK, et al. *Cochrane Database Syst Rev.* 2019;1(1):Cd012424.

84. Wang Q, Jiang X, Shen Y, et al. *BMC Geriatrics.* 2020;20(1):322.





# Common Problems

- Osteoporosis
- Muscle problems
- **Joint problems**

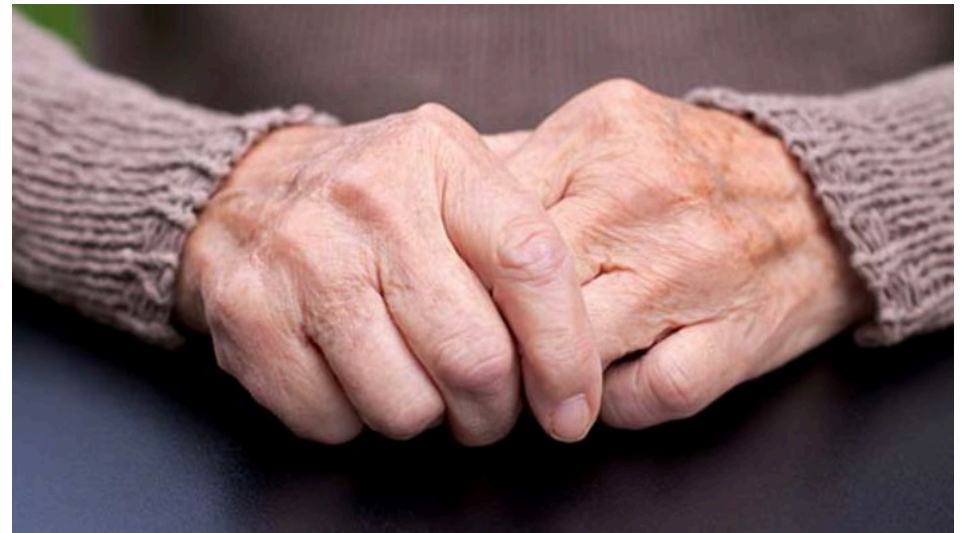




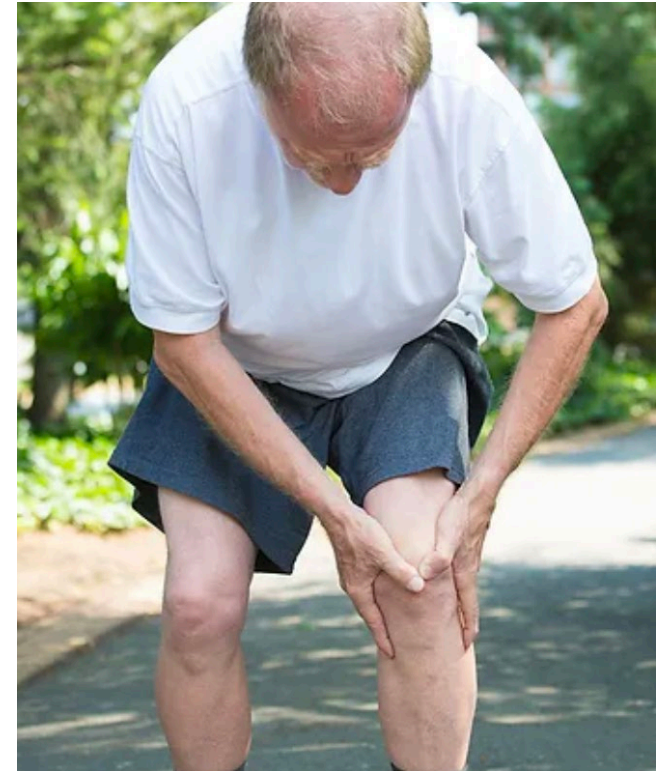
# Osteoarthritis / Bony Deformities

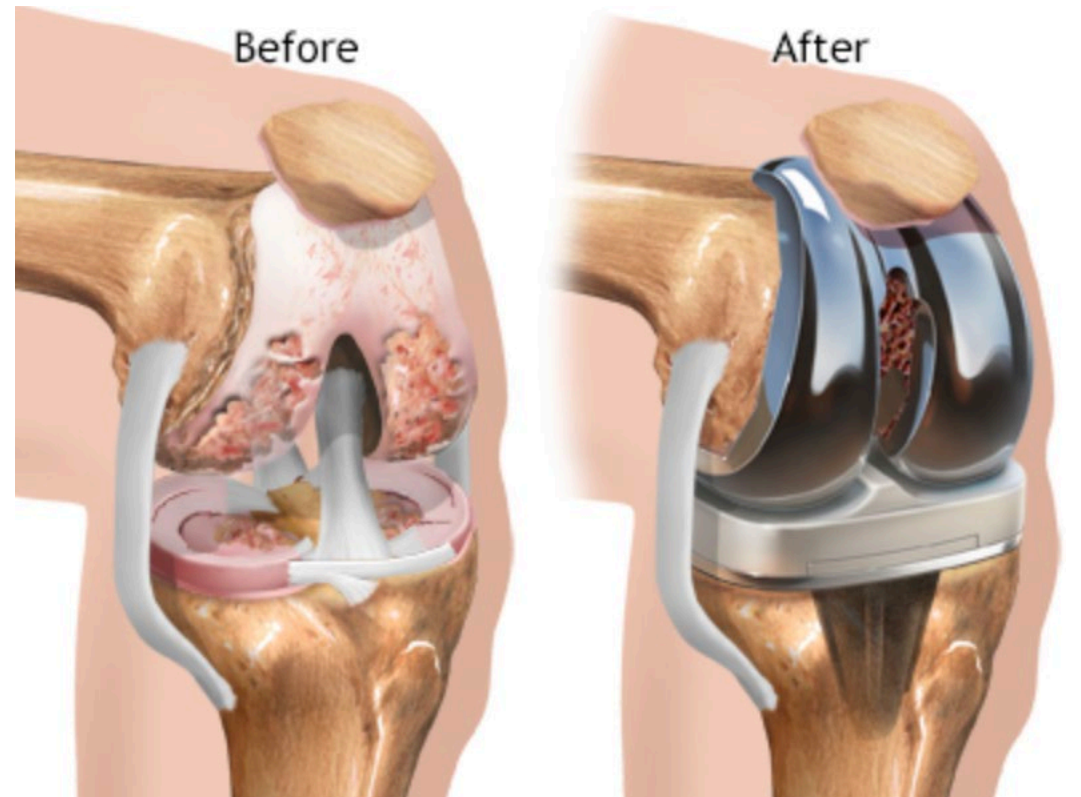
## Who is at risk for osteoarthritis?

- Women are more likely than men to have osteoarthritis, especially after age 50.
- Others include:
  - Overweight or obesity
  - History of injury or surgery to a joint

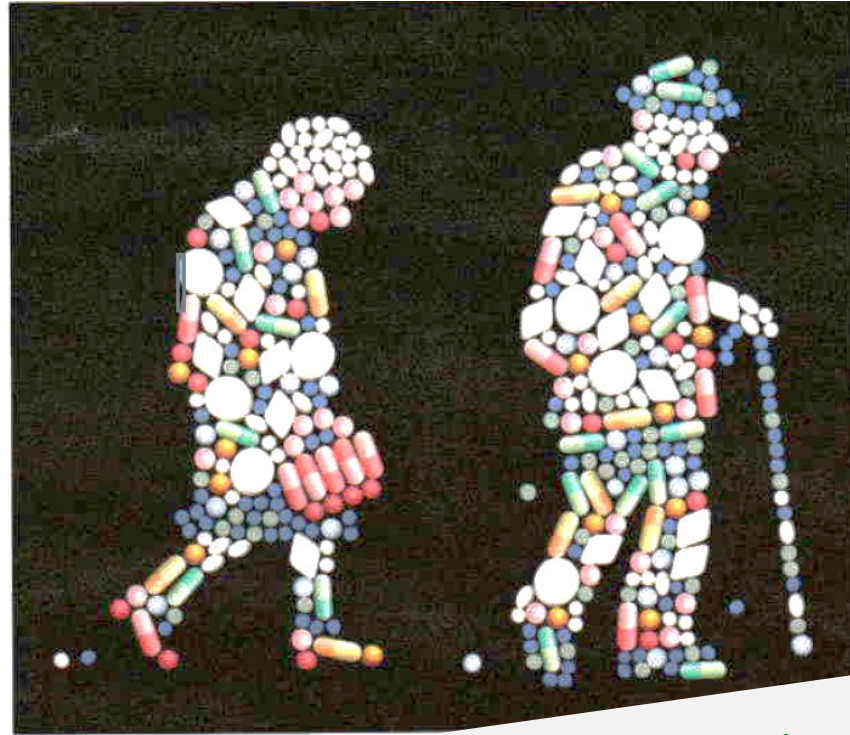


- Overuse from repetitive movements of the joint
- Joints that do not form correctly









Thank You