Sex & Gender Differences in Bone Health

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Scope & Definition

- Sex & gender differences in normal bone development and maintenance
- Bone health = resistance to fracture [mechanical strength]
  - Size
  - Micro-architecture
  - Mineralization
Sex & Gender Differences in Bone Health

Bottom Line:

- Females fracture more than males do
- Females survive hip fracture better than males do
- Important note: Most data from White samples
- May be racial/ethnic variation in sex & gender differences
  - e.g., fracture ratio may similar in Black females & males
Why are males bone-advantaged?

- Sex & gender differences in bone development and maintenance across the life span
Male advantage starts in puberty:
- Greater gain in bone size, cortical thickness, density
- 4 v. 3 y

Stable

Later life male advantage:
- Lower loss rate
- Architectural preservation
- Fewer falls

**MT in Women**
Why do males grow more bone?
Some determinants of peak bone strength are male advantaged

Non-malleable & sex-similar
- Heritability (~ 60-80%)
- Estrogens
- IGF 1

Malleable & male advantaged
- PA: more + ballistic + possibly more responsive
- Greater calcium intake
- PA + Ca interaction
MT-related BMD loss starts 1 year pre-FMP

Mean (LS): -2.5% y LS
Top 25%: -3.6% y → 10.8%

3 year BMD drop
~50% increase fx risk
Similar TBS drop
independent increase fx risk?
Male Disadvantage After Hip Fracture

After hip fracture…

- Male mortality higher
- Men with hip fracture
  - Have more comorbidities
  - Higher delirium risk
  - Higher risk of death w/in 3 months
**Biggest Bang: Build a Bone Bank**
- Maximum malleability
- Optimum PA?
- Sex differences in PA response?

**Limit Losses**
- Rates of decline
  - Early v. later old age
  - Sex specific
- Malleable risks
  - Multi-exposure approach

**Falls**
- M-F differences in risk factors
Equally Big Bang?
Preventing MT-Related Loss
✓ Onset and amt likely predictable
✓ Preventable?

Lessen Later Fractures?