Mortality and Morbidity Trends and Other Assumption Topics

Tuesday March 20, 2018

3:45 – 5:00 pm

ILTCI Mobile App Download Instructions

iPhone
iPad

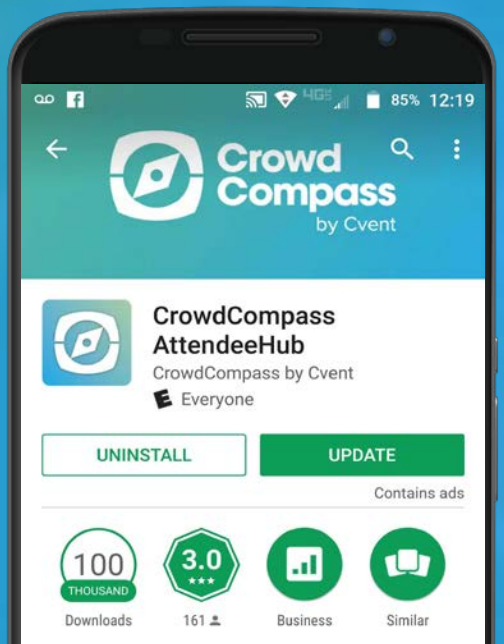
1) Type **https://crowd.cc/s/1flyo** in web browser
2) Click “Download iPhone/iPad App” to load Apple’s App Store and download the app.

android

1) Type **https://crowd.cc/s/1flyo** in web browser
2) Click “Download Android App” to load the Google Play Store and download the app.

BlackBerry

1) You’ll be using the web version of the app. Open the web browser, click the BlackBerry menu button, select “Go To” and type **https://crowd.cc/s/1flyo**.

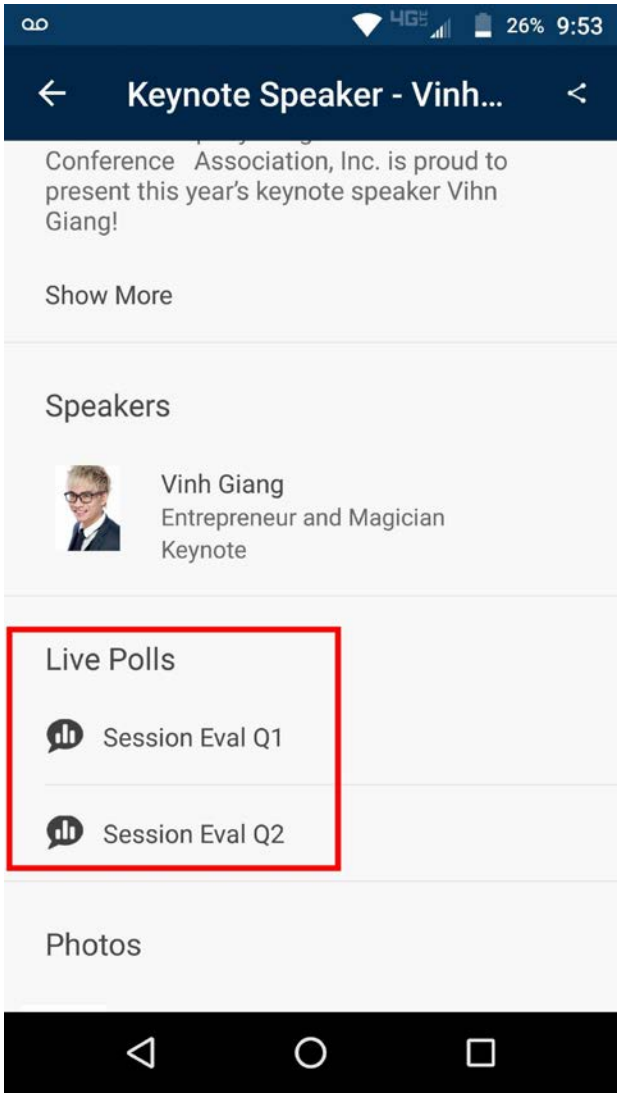


You can also just go to your app store and search ‘AttendeeHub’. Once installed search ‘ILTCI’ and you’ll find our app.

A Special Thank You to this year’s Mobile App Sponsor

Nationwide®
is on your side

Session Survey Instructions



Once you are in the app go to the schedule and the session you are in.

Scroll to the bottom to find the Live Polling questions.

This year the session survey questions can be found in this section and will take just a couple seconds to complete.

Session Producer and Speakers

- Al Schmitz, FSA, MAAA
  - Principal and Consulting Actuary, Milliman
- Chris Giese, FSA, MAAA
  - Principal and Consulting Actuary, Milliman
- Dave Benz, FSA, MAAA
  - Managing Actuary, Long Term Care, GE Capital
- Dave Rengachary, MD
  - SVP and Chief Medical Director, USMM, RGA Reinsurance Company

Trends in Setting Mortality Assumptions

Chris Giese, FSA, MAA

Principal and Consulting Actuary

Milliman

Agenda

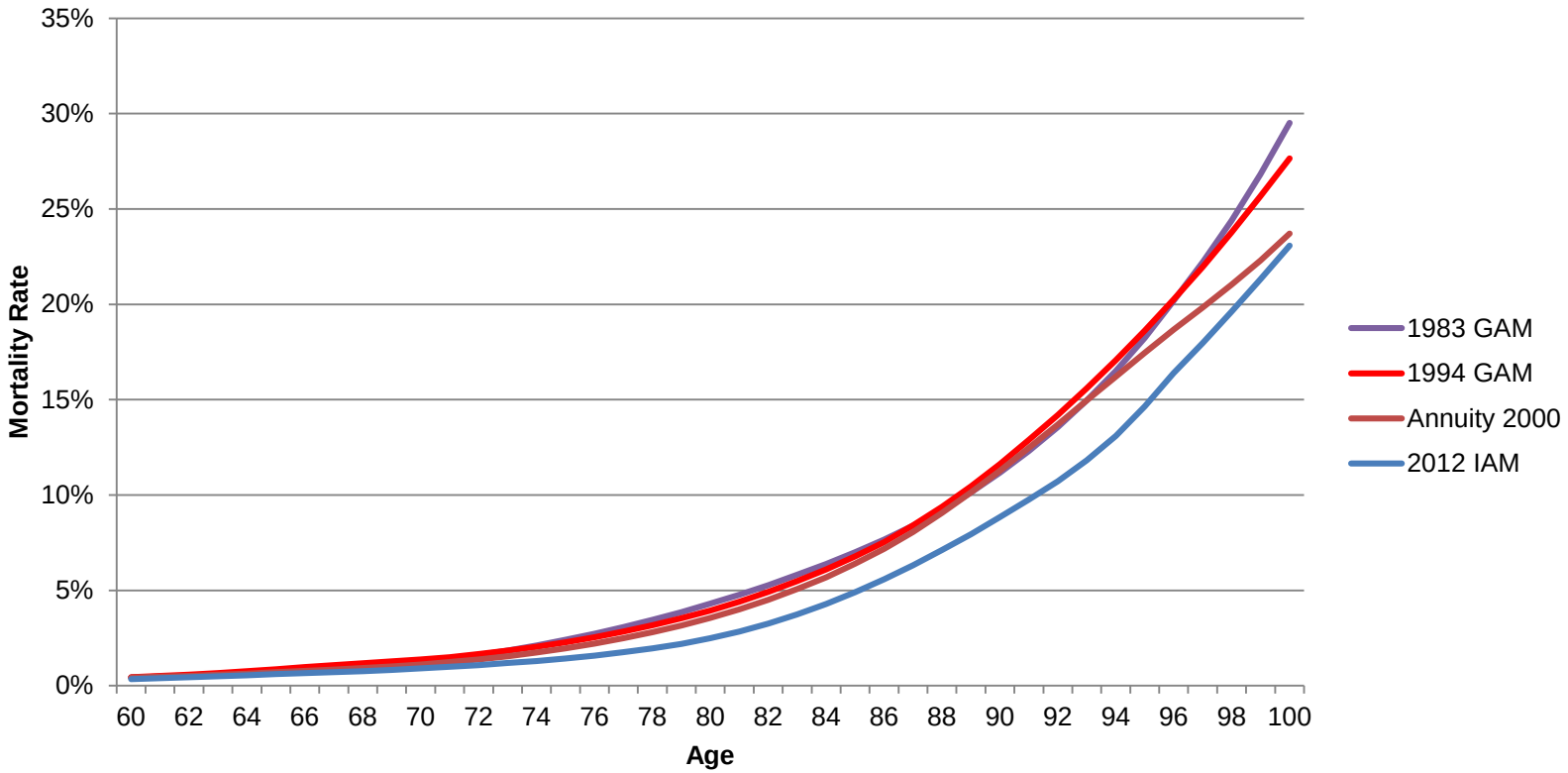
- Overview of Industry Practices
- Assumption Construction
- Active and Disabled Mortality Research Examples
- Mortality Trends

Industry Modeling of Mortality

- Historically used a total mortality approach
- SOA tables and / or Company experience
- SOA table examples
  - 1983 GAM
  - 1994 GAM
  - Annuity 2000
  - 2012 IAM
- Rates used for combined active and disabled lives
  - Active = individuals not on claim
  - Disabled = individuals on claim

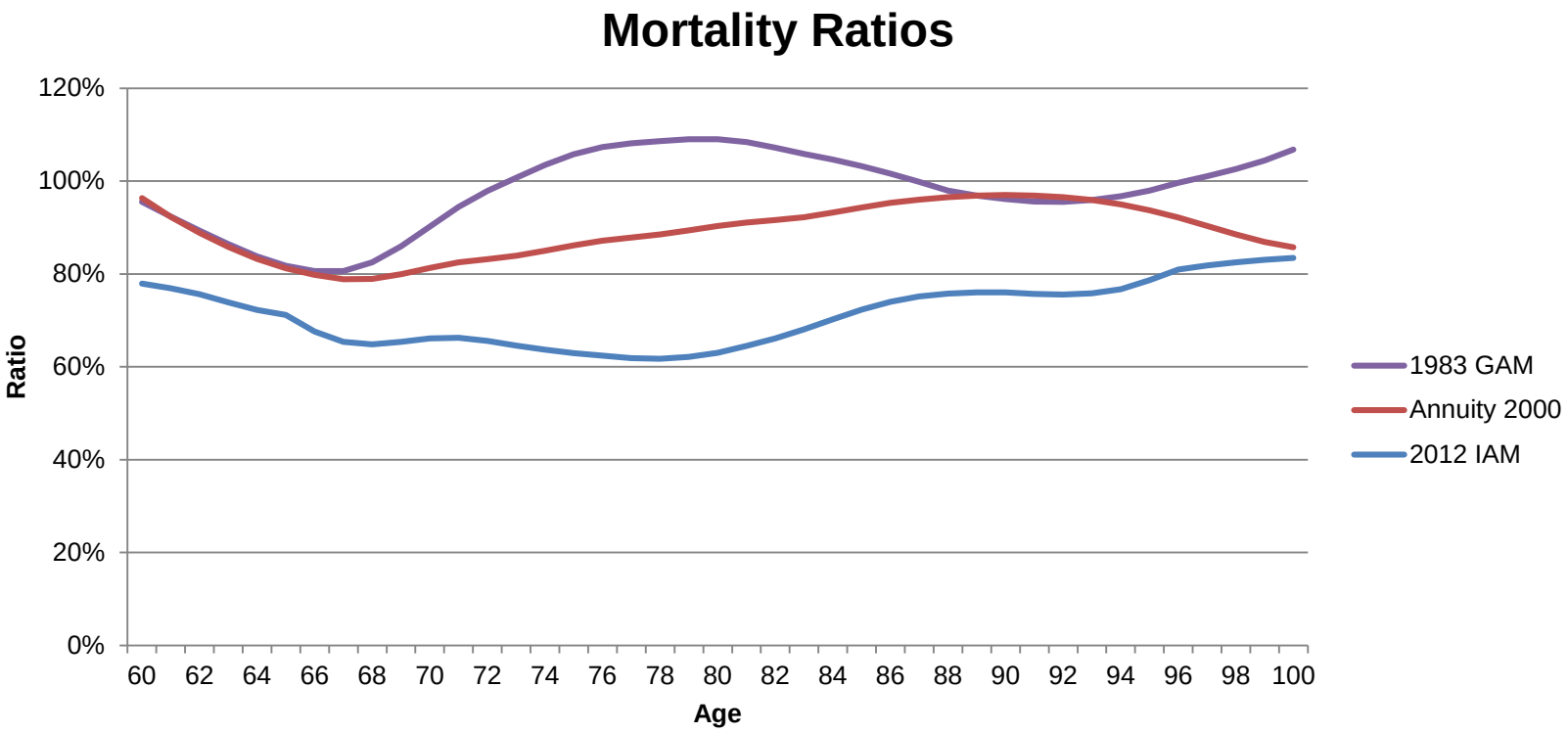
Total Mortality Comparison: Rates

Females
1983GAM, 1994GAM, A2000, and 2012IAM



Total Mortality Comparison: Ratios

Females
Ratio to 1994 GAM



Study Considerations

Company Experience

- Policy Terminations – splitting between death and lapse
- Identifying Deaths – methods
- Assigning Deaths – healthy life death or disabled life death

Splitting Policy Terminations

- Policy termination
  - Need to identify reason policy terminated
    - Death
    - Voluntary Lapse
    - Benefit exhausted

- Deaths are underreported for LTC products
  - Generally no cash value in LTC products, no incentive for insured to let company know about a death
  - Generally better for disabled deaths

Methods to Identify Deaths

Internal Source

- Company operations area
- Other lines of business (such as life insurance)

External Source

- Social Security Death Master File (DMF)
  - Due to privacy concerns, DMF is not as inclusive as past
  - Type of “join”
    - Social Security Number only
    - SSN & Date of Birth
    - SSN, Death of Birth, and Name
  - Need to only include matches where the date of death is close to the termination date
  - How strict will ↑ or ↓ deaths
- Vendors
- State information

Assigning Deaths

- Assign deaths
  - "Healthy Life": Died while not on claim (such as premium paying)
  - "Disabled Life": Died while on claim
- Elimination Period
  - Consistency of claim definition
  - Projection model impact
  - Claim reserve impact
- End of claim
  - Relationship of claim end date and date of death
  - Situation where claim closes, but policy continues for a short period, then the policy terminates
  - Need a rule for distance between claim end date and date of death

Variables Influencing Total Mortality

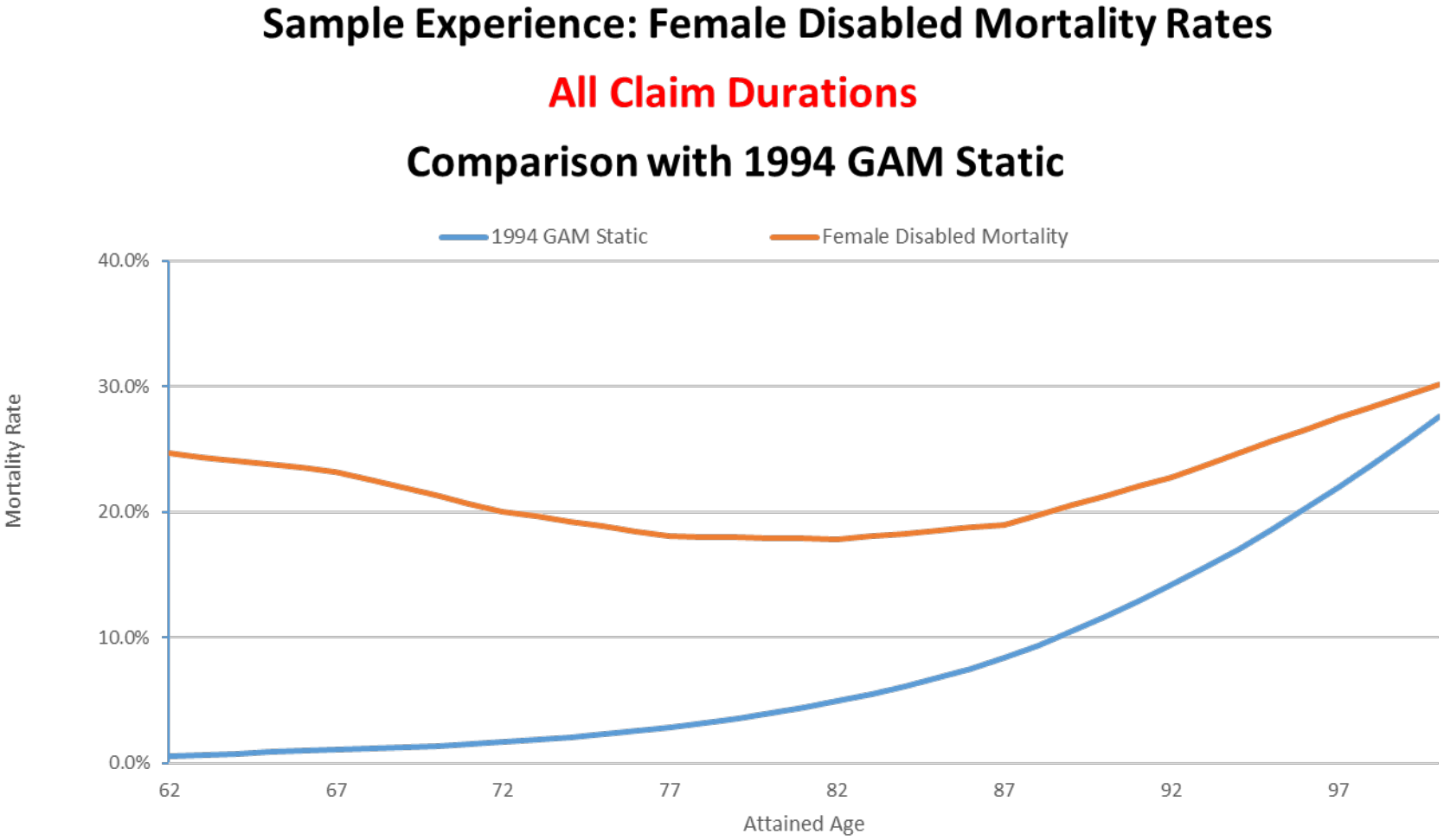
Examples

- Attained age
- Gender
- **Active and disabled mix**
- Underwriting selection
- Risk class
- Correlation with morbidity experience
- Calendar year changes or “improvement”
- Anti-selection impacts, particularly following rate increases
- Care setting
- Time on claim

Evolving Approaches

- Actuarial models historically used
  - Policy terminations – active and disabled mortality not separated
  - Claim terminations – disabled mortality and recoveries not separated
- Movement toward “First Principles” models
  - Policy terminations – model active and disabled mortality separately
  - Claim terminations – model disabled mortality and recoveries separately
- Use of predictive modeling
  - Identify variable importance and dependence

Females – Disabled Mortality Estimate

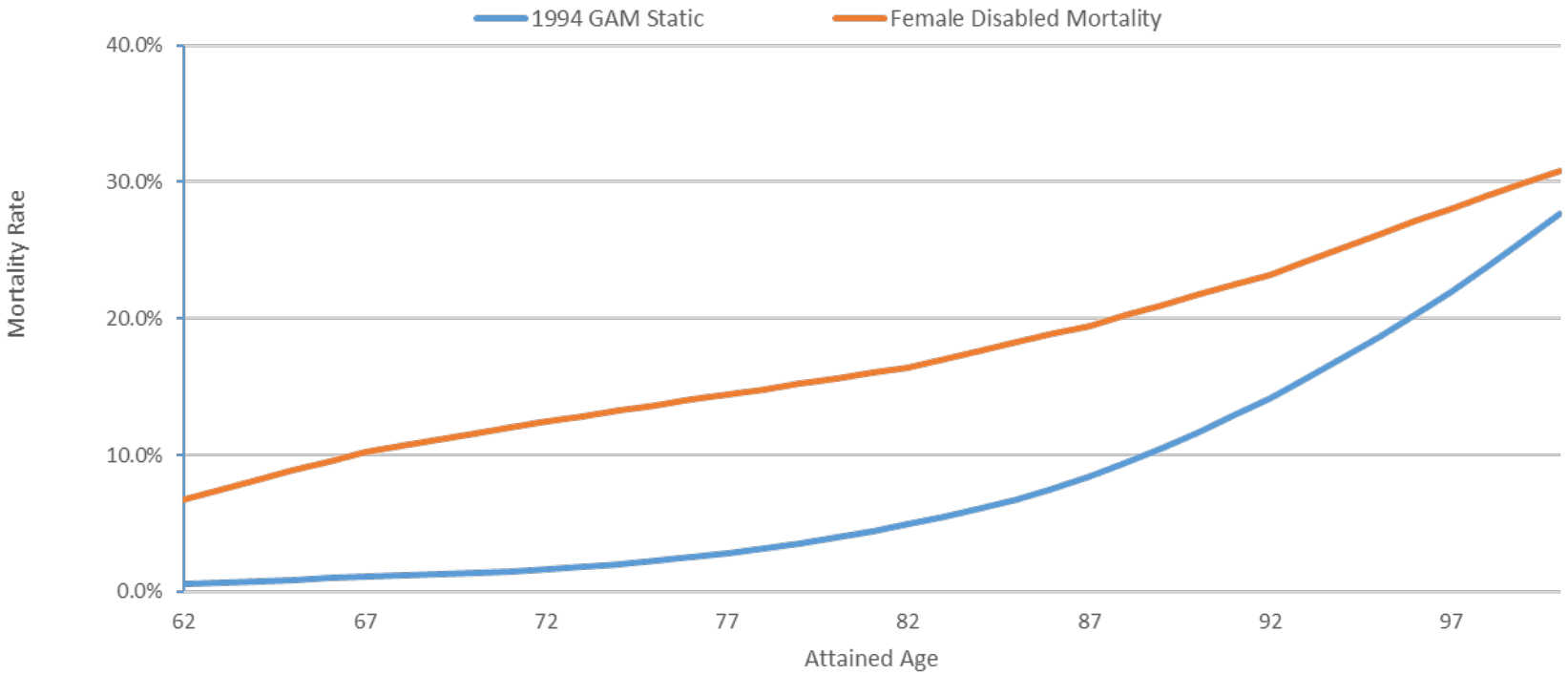


Females – Disabled Mortality Estimate

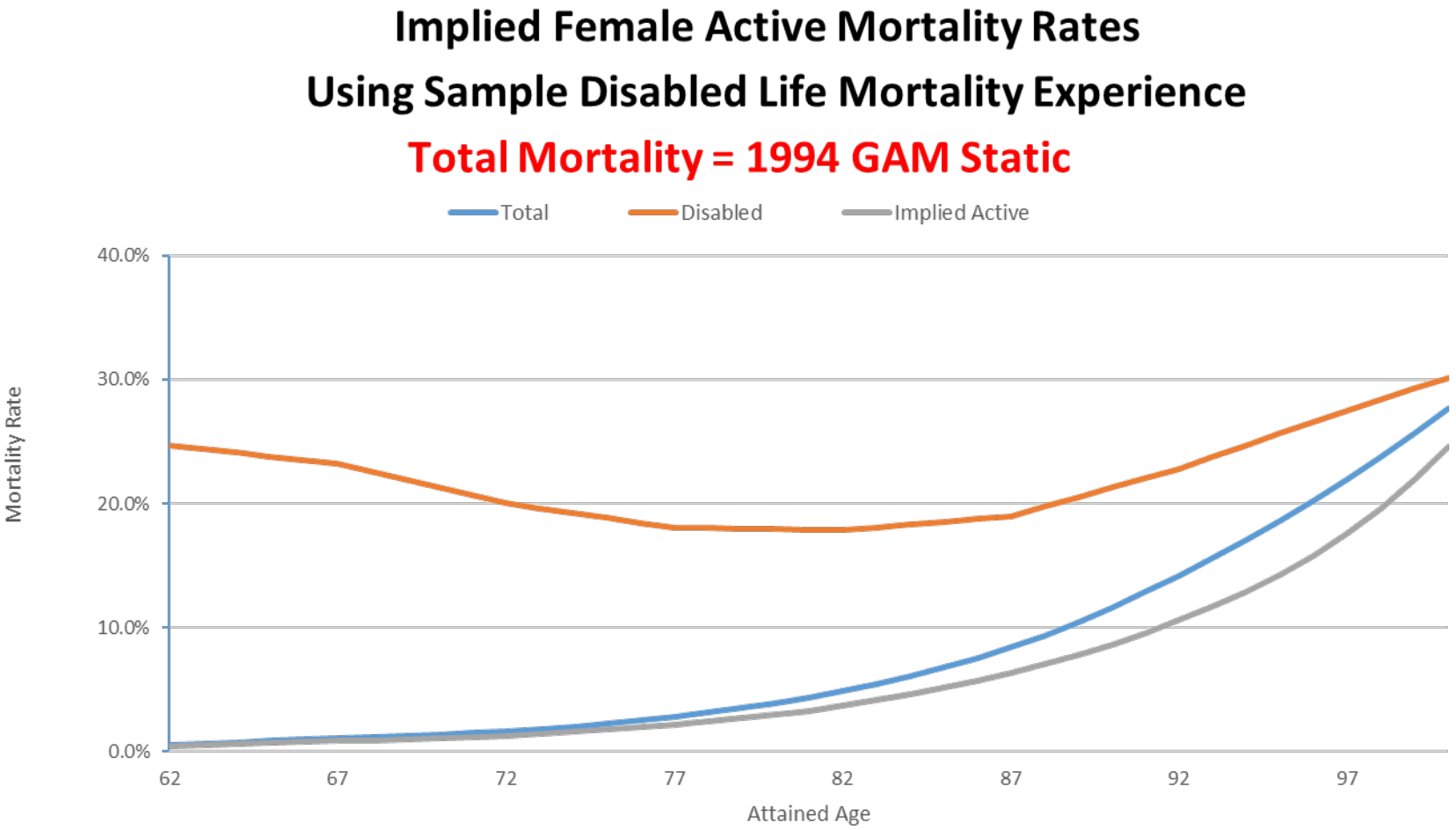
Sample Experience: Female Disabled Mortality Rates

Claim Duration 3+

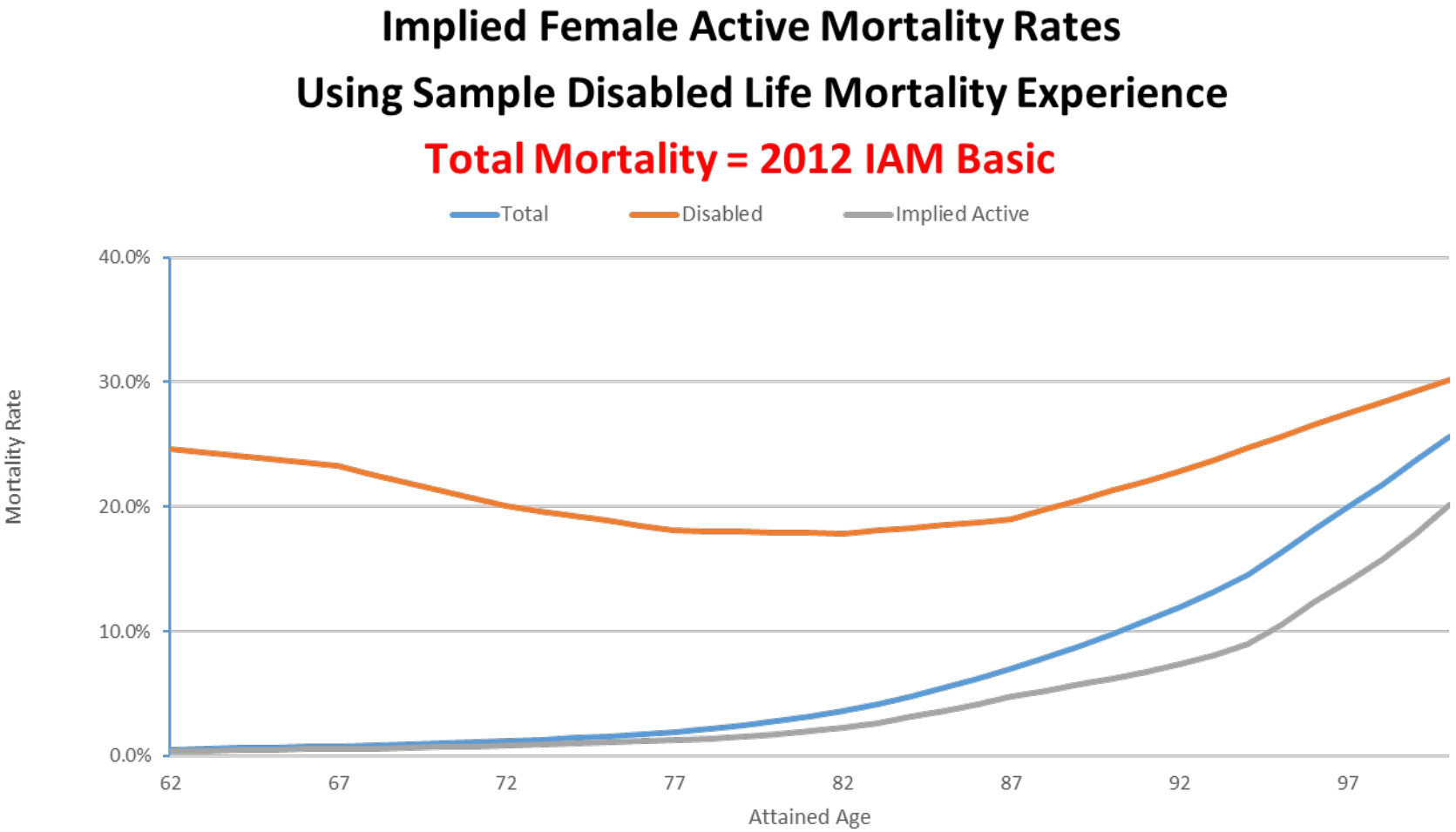
Comparison with 1994 GAM Static



Disabled, Active, and Total Mortality



Disabled, Active, and Total Mortality



Active vs. Total Mortality Observations

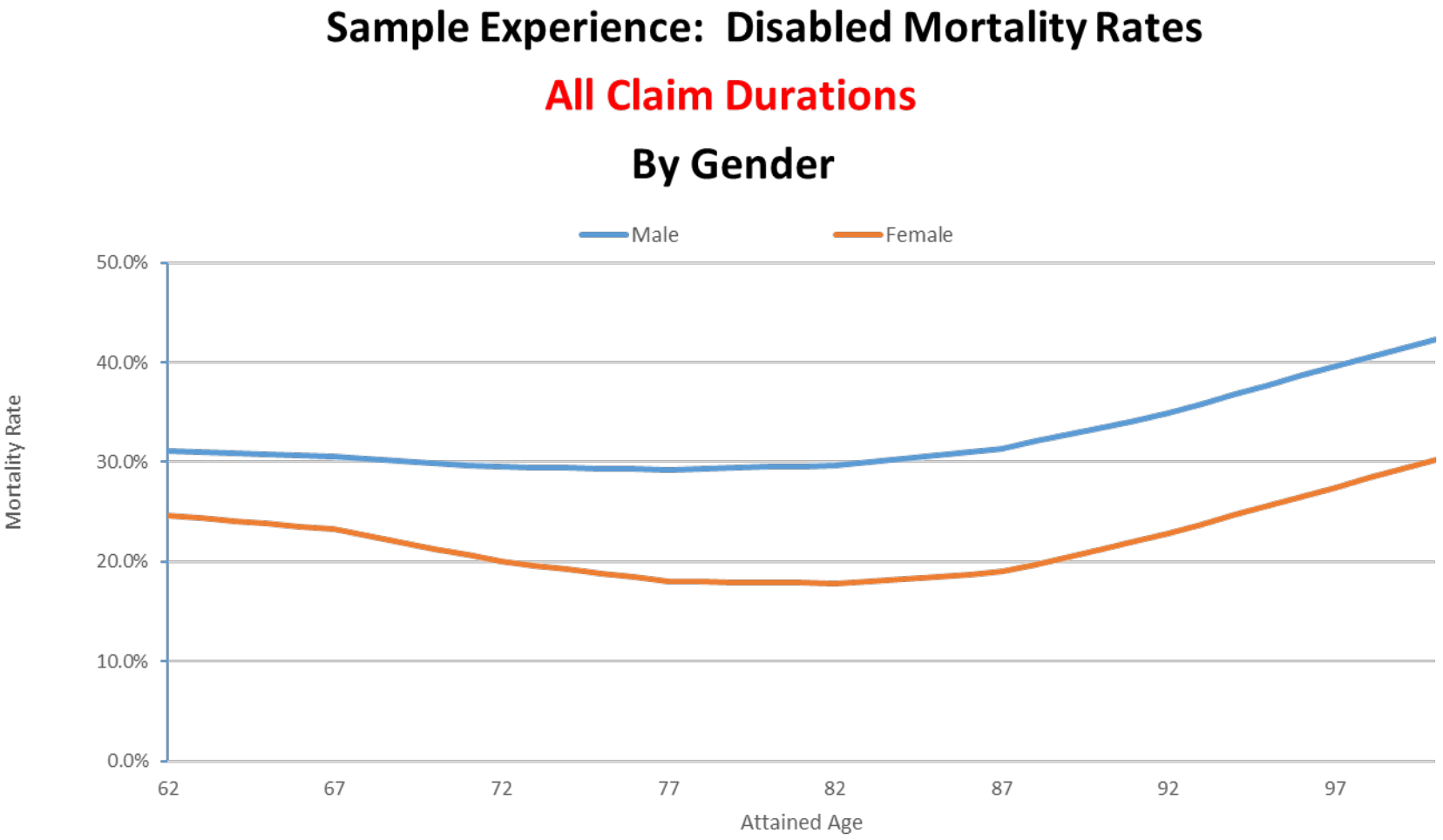
- Watch out for misaligned tables
  - Could lead to counterintuitive results, such as a drop in implied active life mortality with increasing age
- Active life mortality vs. 2012 IAM (sample)
  - Ultimate observed was 80% to 90% of 2012 IAM
  - Ultimate ratio appeared consistent across issue ages
  - Variation by gender
    - Male mortality tended to be closer to 2012 IAM
    - Female “A/E” was roughly 25% lower than male

Disabled Mortality Observations

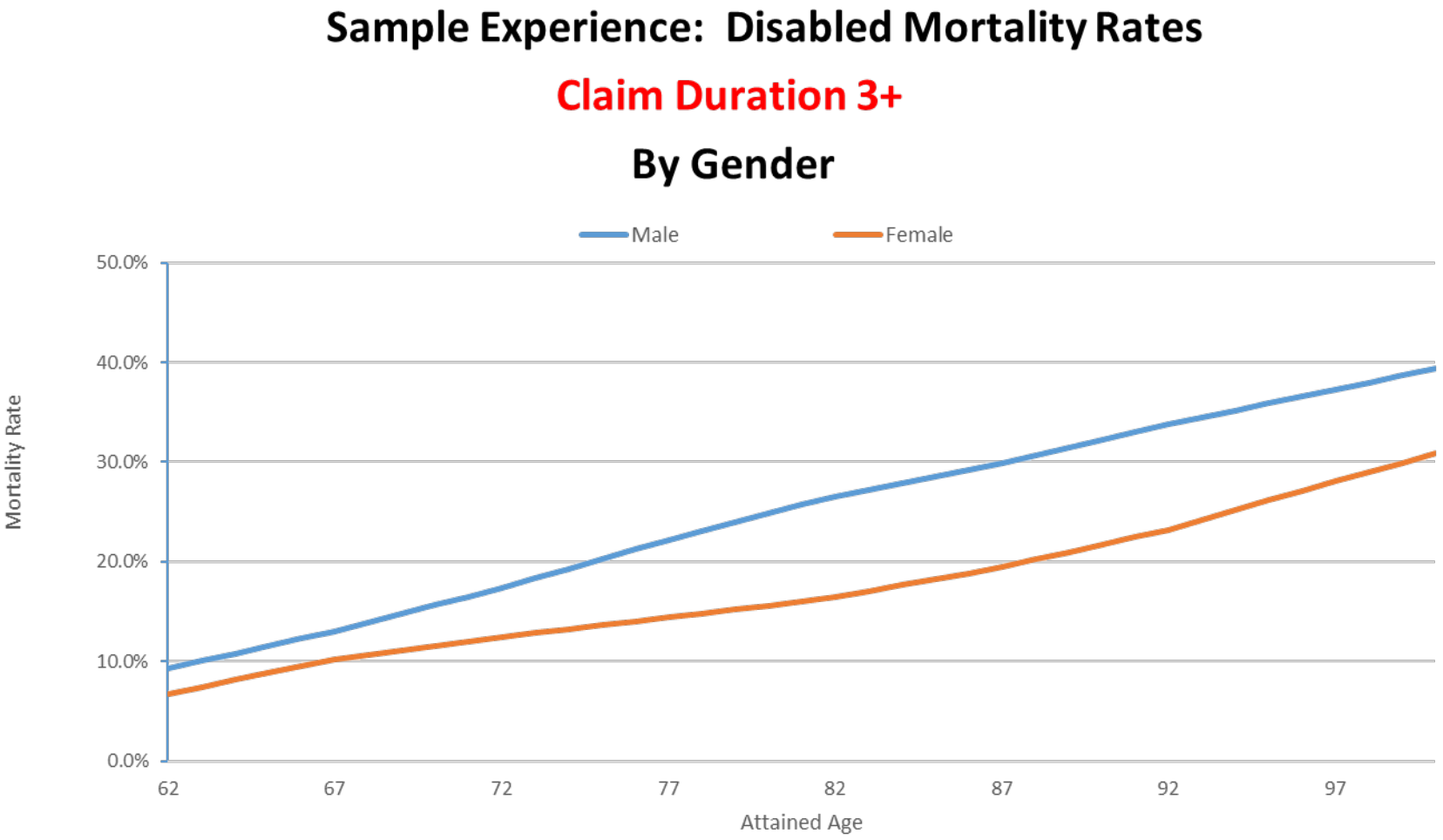
Significant variability

- Gender
- Claim Duration
  - Claim year 1 higher
  - Claim year 2 tends to be the lowest
  - Mortality generally stable after claim year 2
  - Patterns by age and duration
- Care Setting
  - SNF > HHC > ALF
  - Pattern varies by claim duration

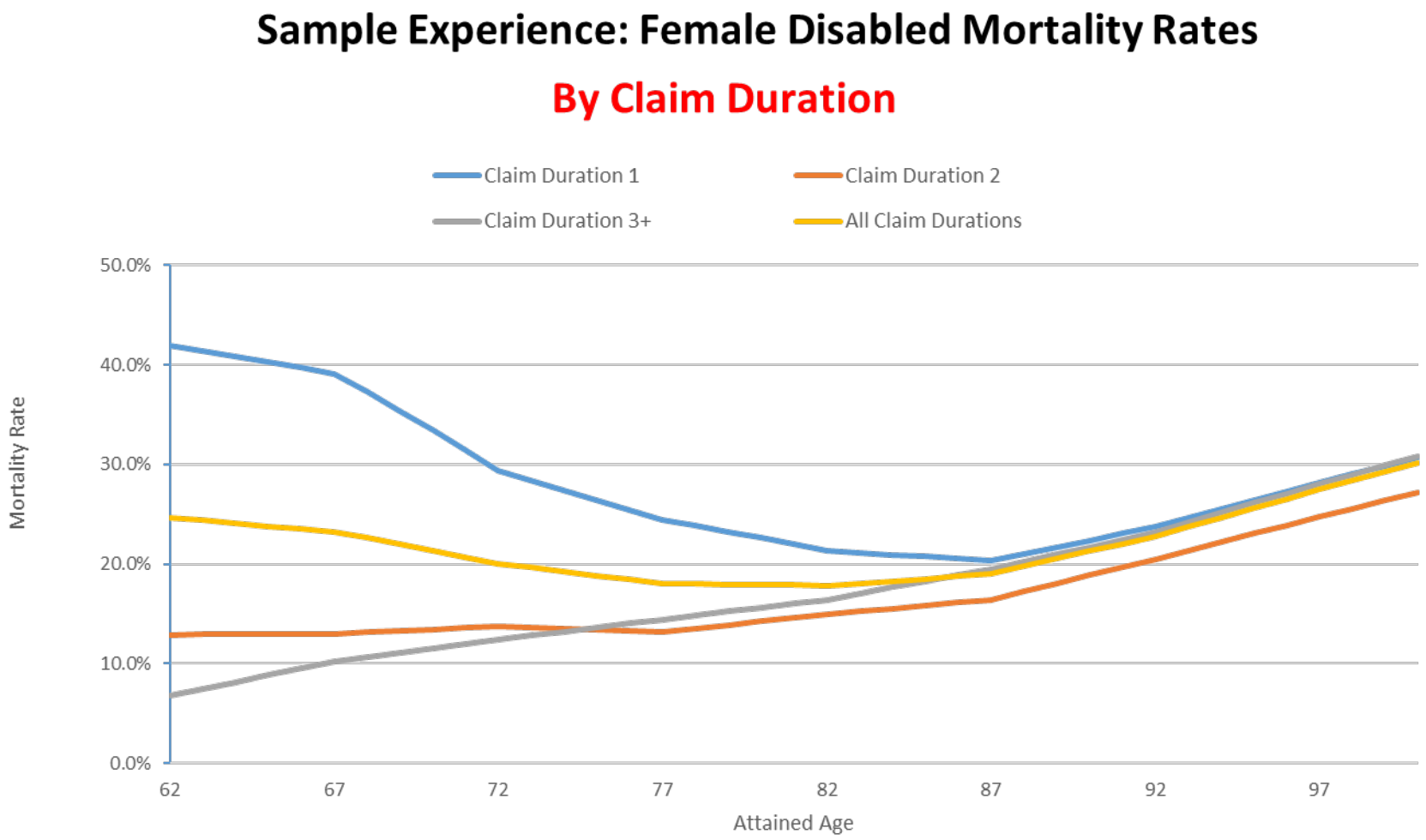
Summary Disabled Mortality – Gender



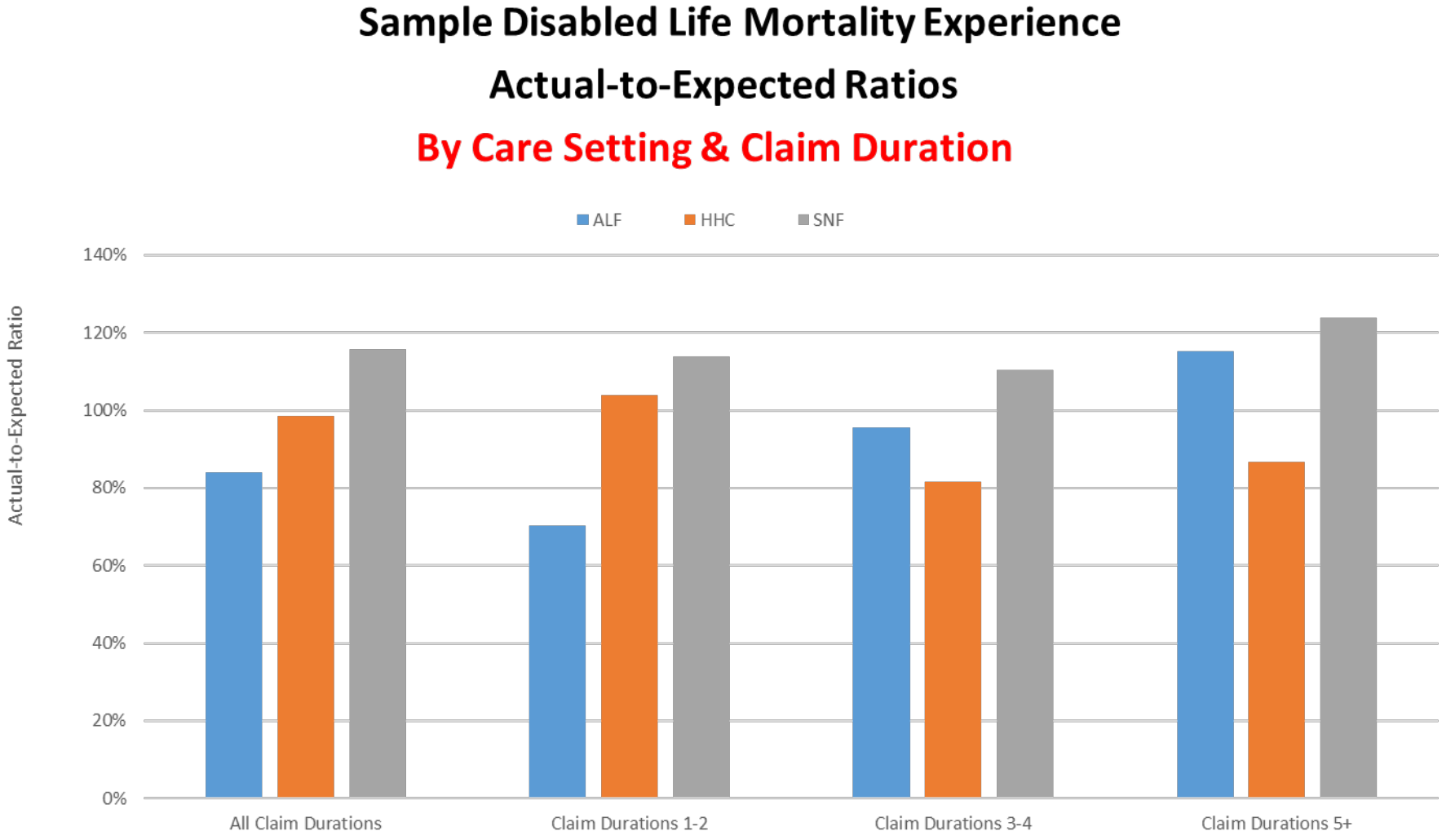
Summary Disabled Mortality – Gender



Variability by Claim Year



Variability Care Setting



Disabled Deaths Relative to Recoveries

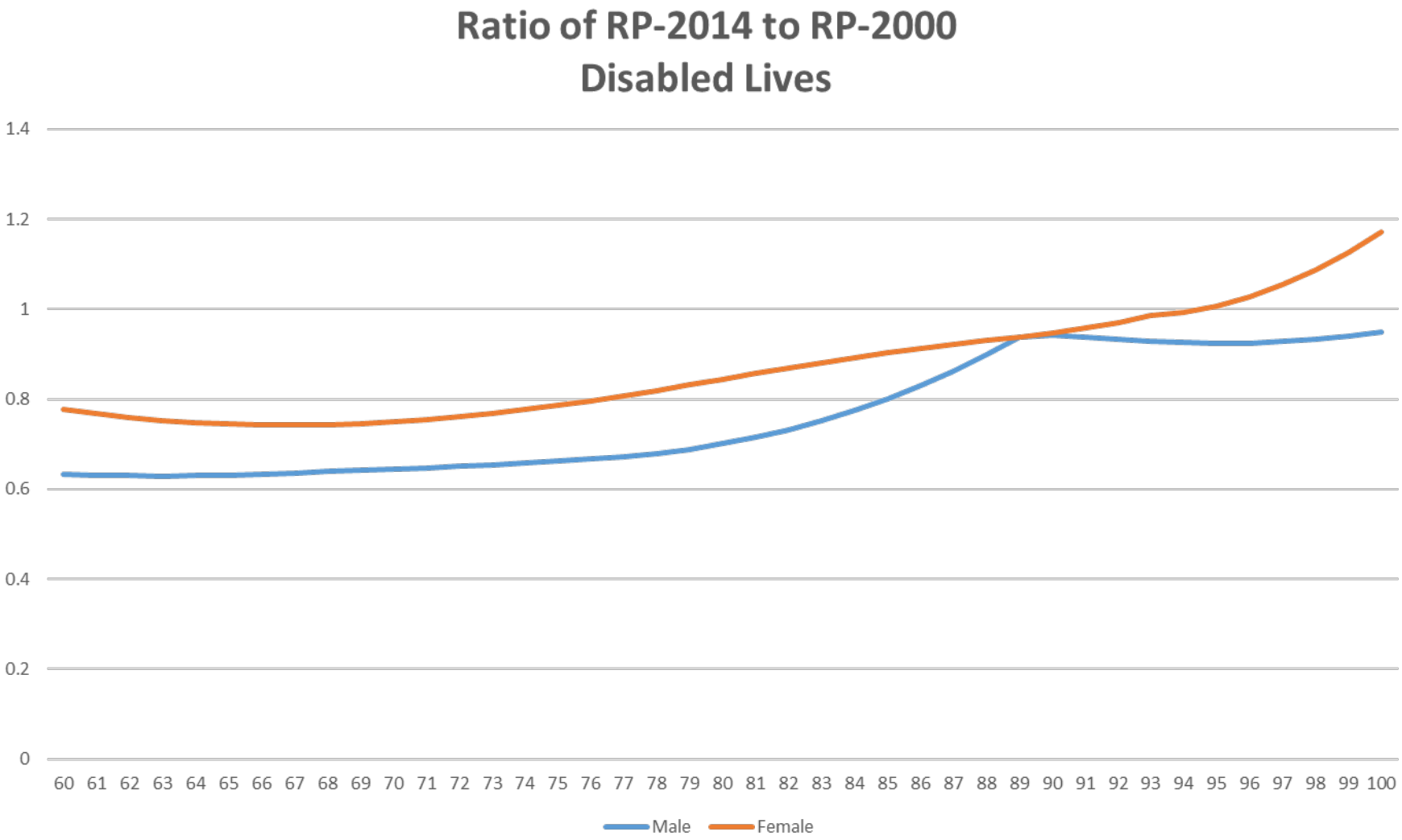
Disabled deaths are 40% to 70% of total claim terminations

- Varies by age – higher percentage at older attained ages
- Potential underreporting results in higher percentage of recoveries

Mortality Trends (“Improvement”)

- Many influences; examples:
  - Medical advancement, improved work conditions, public health initiatives, individual lifestyle changes, increases in income/education
- Considerations
  - Population segment
    - General population vs. insured LTC population
    - Active and disabled
  - Projecting into the future
    - Industry practices
    - SOA scales
    - Link to morbidity

Disabled Mortality – Retired Pensioner



Takeaways

- First principles and predictive modeling pushing improvement to better understand mortality
- Showed samples today – significant variations expected within and across blocks
- Fitting mortality together with morbidity
  - Correlations
  - Implied in severity
- What does the future hold?

Morbidity and Morbidity Improvement

Dave Benz, FSA, MAA

Managing Actuary, Long Term Care

GE Capital

DISCLAIMER

This presentation and the views expressed within the oral presentation are being offered for your convenience and education and may contain opinions and viewpoints that are not the opinions and viewpoints of Employers Reassurance Corporation, Union Fidelity Life Insurance Company, General Electric Corporation or any of its affiliates. Employers Reassurance Corporation, Union Fidelity Life Insurance Company, General Electric and its affiliates make no representations or warranties of any kind, express or implied, regarding the accuracy, reliability, completeness, timeliness or applicability for a particular purpose of the information contained in this presentation and make no endorsement of the opinions of the presenter offered herein.

LTC Morbidity

- Incidence – probability of a claim
- Continuance – length of a claim
- Utilization – benefit amount used during a claim

Measuring LTC Morbidity Improvement

Incidence

- Compare rates at comparable attained ages at different time periods

Continuance

- Compare claim lengths over different incurred years

Utilization

- Compare utilization rates year to year

The first four all need some care in controlling for distribution differences – anything by which the assumption may vary

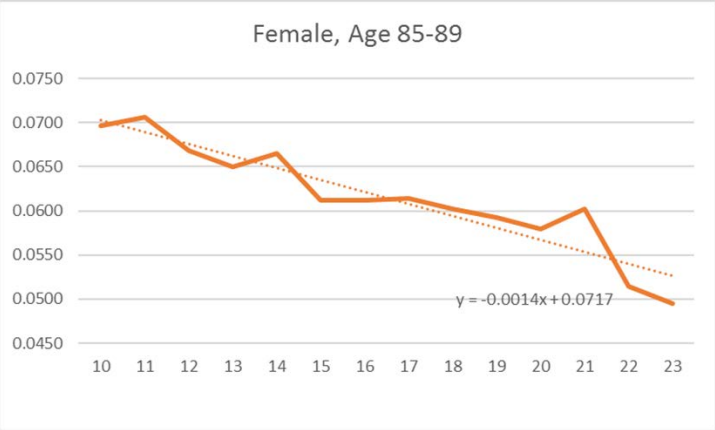
Total Claim Cost Approach

- Build a calendar year adjustment into your experience studies

The “safe harbor” of industry benchmarking

- Treat this as a future assumption only – largely independent of past experience

Incidence Indications in the SOA Experience Database

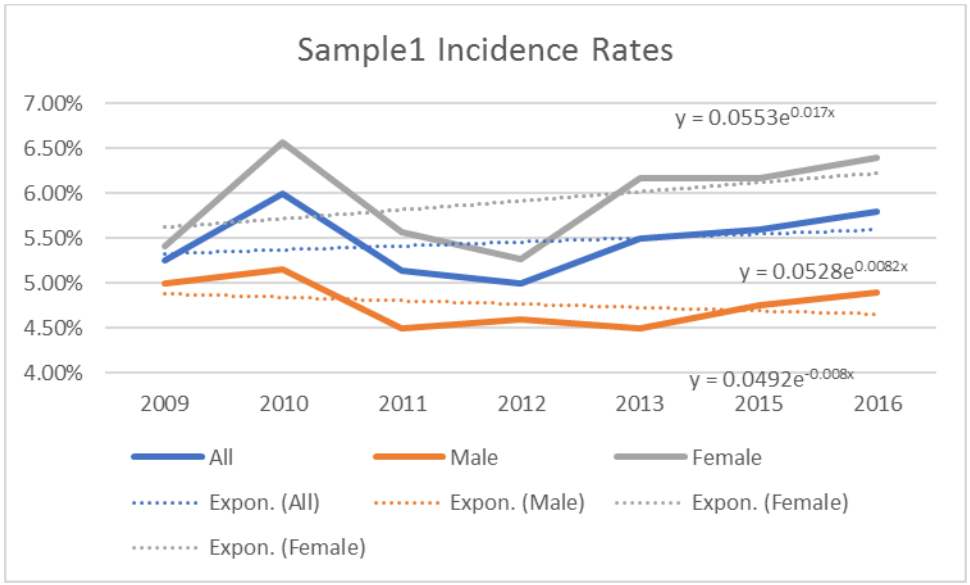


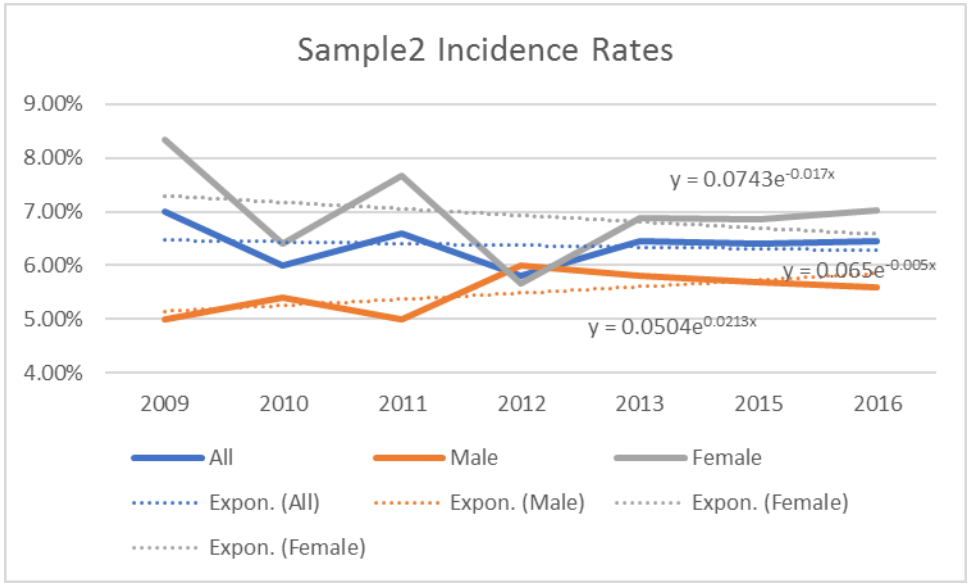
Incurred Age Group	Calculated Durational Change	Durations Used in Analysis
Female 80-84	-1.4%	13
Male 80-84	-0.7%	12
Female 85-89	-2.3%	14
Male 85-89	-1.4%	13
Female 90+	-1.6%	14
Male 90+	-0.9%	13

- Database does not include calendar year
- Used constant attained age groups and varied duration
- Duration 10+, at least 50 claims

See: *Long-Term Care News*, August 2017 for fuller discussion

Incidence Indications at Company Level





- Results mixed
- Credibility low
  - Direction may be more important than absolute value
  - Tradeoffs between sample size and homogeneity

Charts and graphs are illustrative only

Another Look at Incidence Indications

Durations 11+ - all experience	Attained ages 75-79	Attained ages 80-84
Issue ages 65-80	1.95%	3.70%
Issue ages 55-64	1.50%	3.00%
Durations 11+ - female, 90/Unl, compound IPO, comprehensive	**Attained ages 75-79**	**Attained ages 80-84**
Issue ages 65-80	3.55%	4.35%
Issue ages 55-64	1.55%	3.70%

Charts and graphs are illustrative only

Need to be careful with cell distributions – but that reduces exposure

Long Term Care Morbidity Improvement Study
(Stallard and Yashin)

- Population data – generally non-insured
- 1984-2004 observation period
  - Cohort analysis vs. extrapolation
- Benefit trigger is estimated
- Primarily an incidence look with some look at length of disability, nothing on utilization
- Oldest ages show less improvement on very limited data
- Cannot account for policyholder behavior

Common Pitfalls

- Conflation (the process or result of fusing items into one entity) and compounding (to increase or add to)
- Policy design influence
- Outside influencers
  - Rate Increase Activity
  - Economy
- Issues when including in your experience studies

Conflation and Compounding

The major risk is measuring the same effect in different ways and assuming they are two separate items to include moving forward

Attained age

Issue age and duration

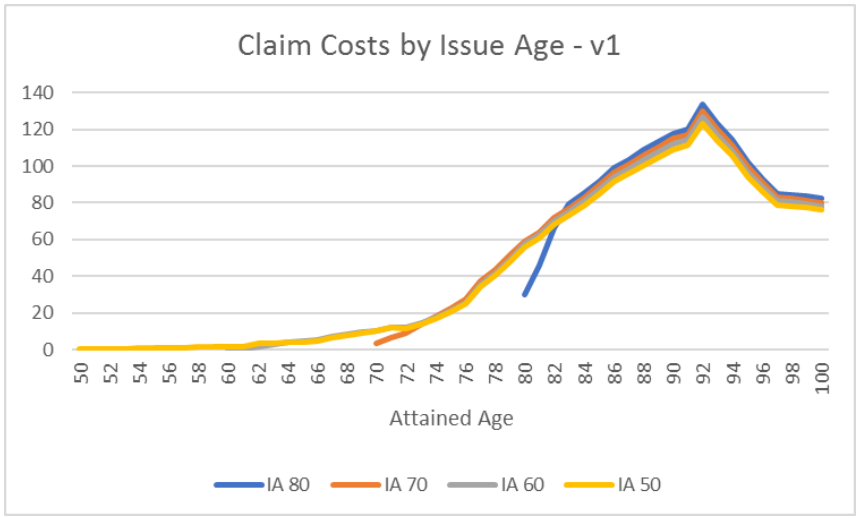
Calendar year

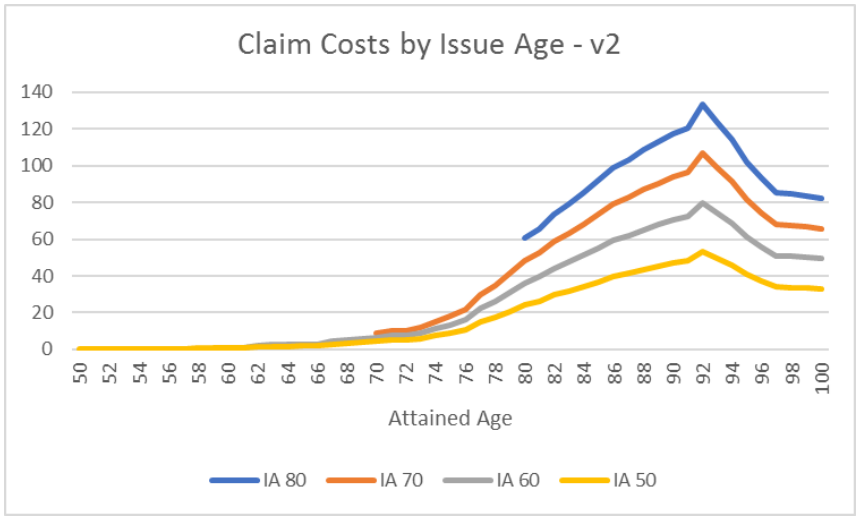
Conflation and Compounding

The major risk is measuring the same effect in different ways and assuming they are two separate items to include moving forward

Issue Age Differentials – idea grows from the thought older applicants might know more about their likelihood of needing care than younger applicants

Why would someone under age 50 buy LTC?

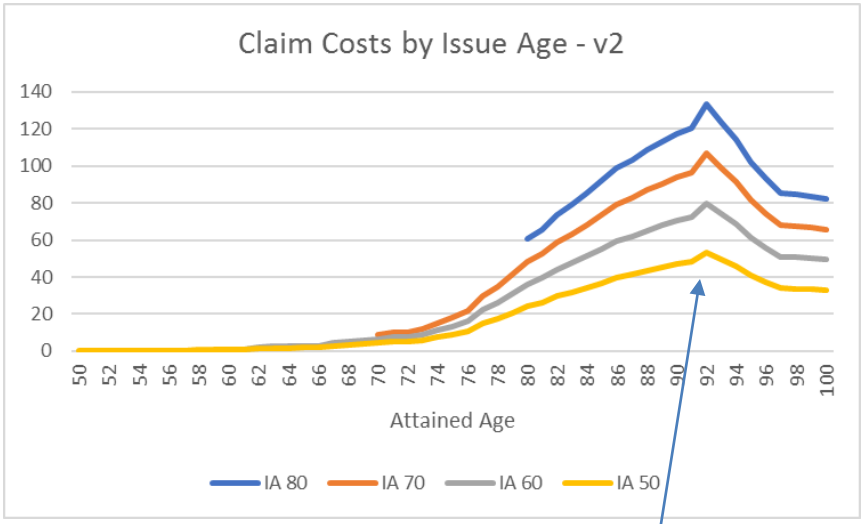




Charts and graphs are illustrative only

What might be happening in v2?

- Observing morbidity improvement (calendar year) but including it as an issue age-duration effect – are you also including a separate morbidity improvement assumption?
- You might be correcting for a slope issue with the underlying claim cost table (attained age) and extrapolating (by calendar year or duration) to your detriment

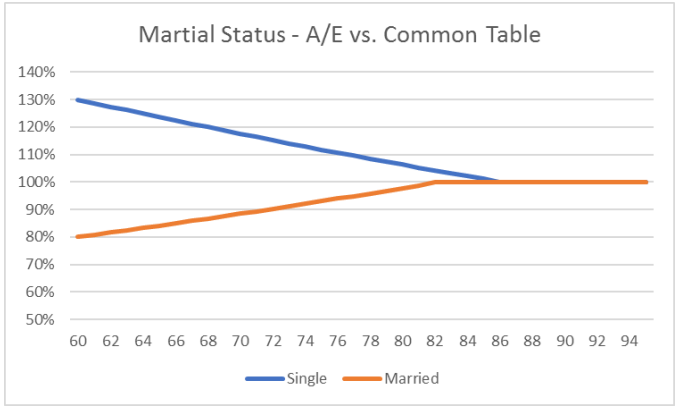


An 18% difference between two issue ages 10 years apart is equivalent to 2% morbidity improvement for 10 years

Charts and graphs are illustrative only

Conflation and Compounding

- Utilization improvement – consistency in measurement and projection?
- Issue era or policy form series factors – measuring true differentials or including other sources of improvement?
- Underwriting and spousal discounts
  - Are the impacts on morbidity constant by duration or age?
  - How are you building your base claim cost tables?
  - Are the distributions of the discounts relatively constant by attained age?



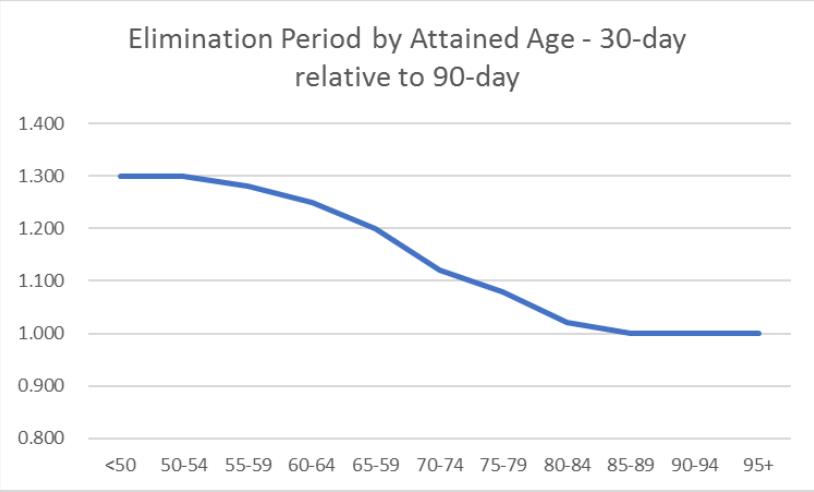
Charts and graphs are illustrative only

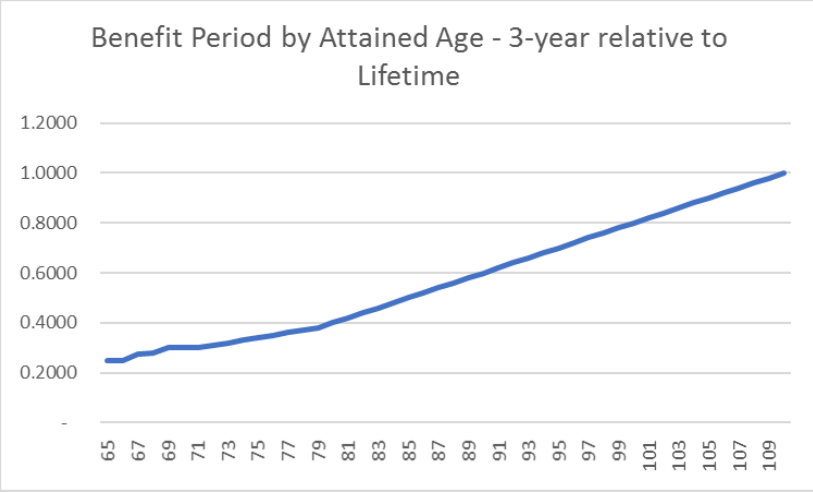
Policy Design Influence

Everything converges in the 90s?

Policy design may have more influence on decisions made at younger age – this seems to influence both incidence and severity

How might this influence your improvement measurements?

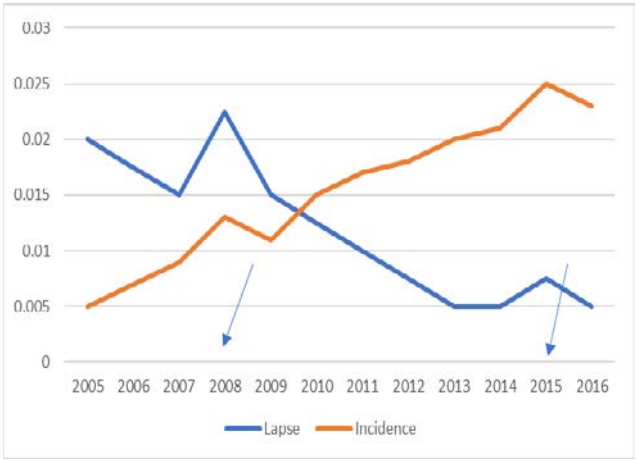




Charts and graphs are illustrative only

Variability Over Time

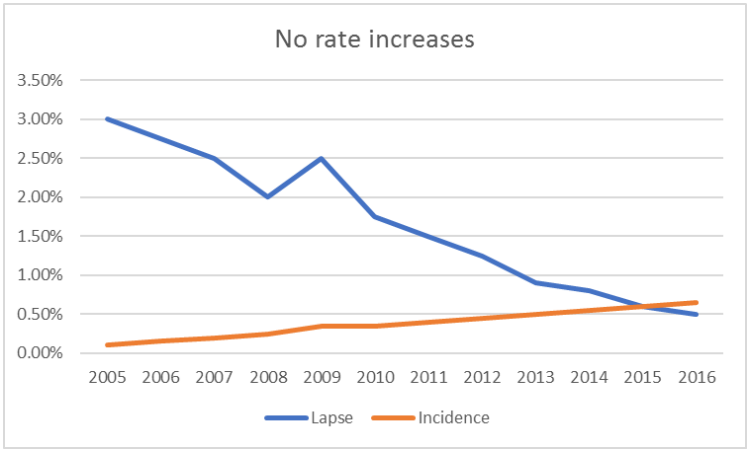
Rate Increases and the Economy

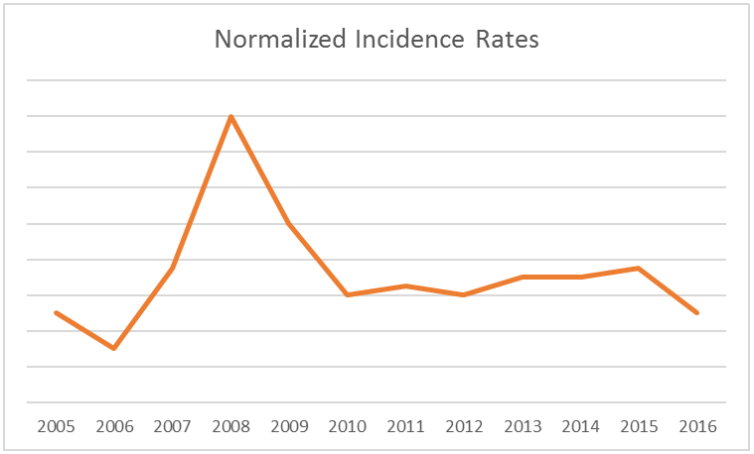


Rate Increases can cause shock lapse and incidence.

Incidence may be “borrowing” from later years…severity impact?

Did the Great Recession have a similar impact?





Charts and graphs are illustrative only

Considerations in Experience Studies - Summary

- Correct underlying table – from what are you improving?
- Table slope
- Noise
  - Issue age, issue era
  - Utilization changes
  - Continuance changes
  - Underwriting and spousal discounts
  - Rate increases influence policyholder behavior
  - Economy
  - Policy language, claim administration, and underwriting changes
- Will future be like the past?
  - Cohort health analysis – many claim mortality improvement has already stopped
  - Medical advances and changes in care delivery
  - Does it vary by attained age as mortality improvement seems to?

Key New Medical Drivers in Morbidity and Mortality

Dave Rengachary, MD
SVP and Chief Medical Director, USMM
RGA Reinsurance Company

#1: Incorporation of Whole Genome Sequencing into Clinical Care

Whole Genome Sequencing

- Prevention of Disease manifestation - BRCA
- Precision Medicine
  - Pharmacogenetics
  - Cancer treatment
- Newborns screening
- Accurate diagnosis of rare disease
- Everything – “book of life analogy”

https://pixabay.com/en/dna-biology-medicine-gene-163466/ Creative commons attribution CC0

Whole Genome Sequencing

What about morbidity?

- Lifestyle modification
  - ApoE
  - Cardiac risk prediction
  - Epigenetic analysis – Smoking, exercise, diet
- Avoiding cumulative burden of disease and medication toxicity
- MedSeq Results
  - 34% New clinical actions for WGS+FH (vs. 16% FH alone)
  - 41% of WGS + FH (vs. 30% FH alone) reported making healthy behavior change *at six months*

Jason L. Vassy, Kurt D. Christensen, Erica F. Schonman, Carrie L. Blout, Jill O. Robinson, Joel B. Krier, et al. The Impact of Whole-Genome Sequencing on the Primary Care and Outcomes of Healthy Adult Patients: A Pilot Randomized Trial. Ann Intern Med. 2017;167:159–169

Whole Genome Sequencing

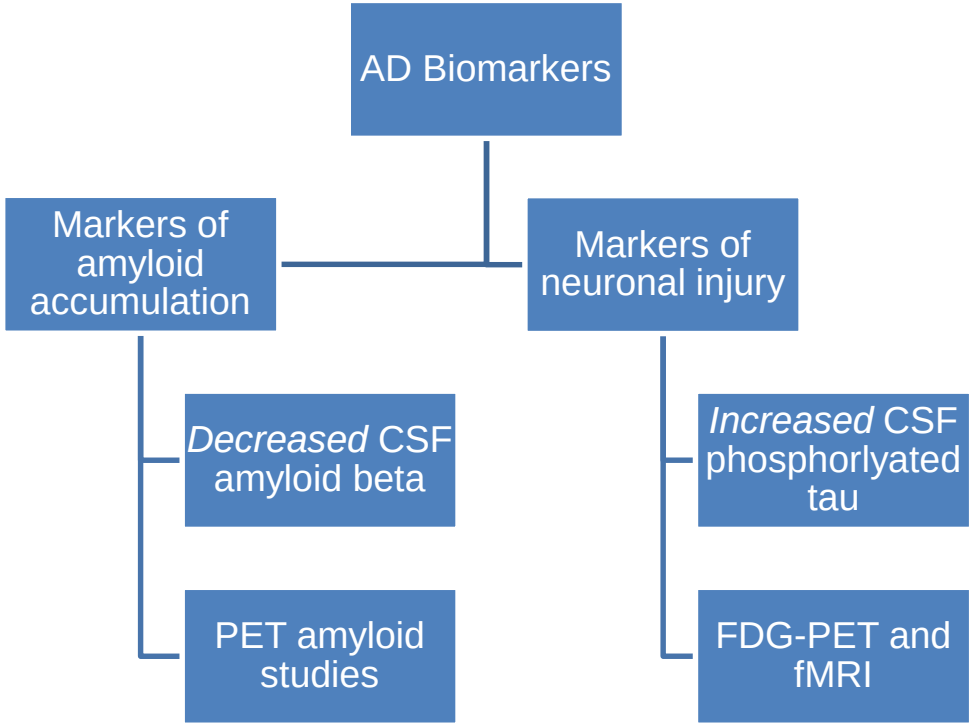
Limitations

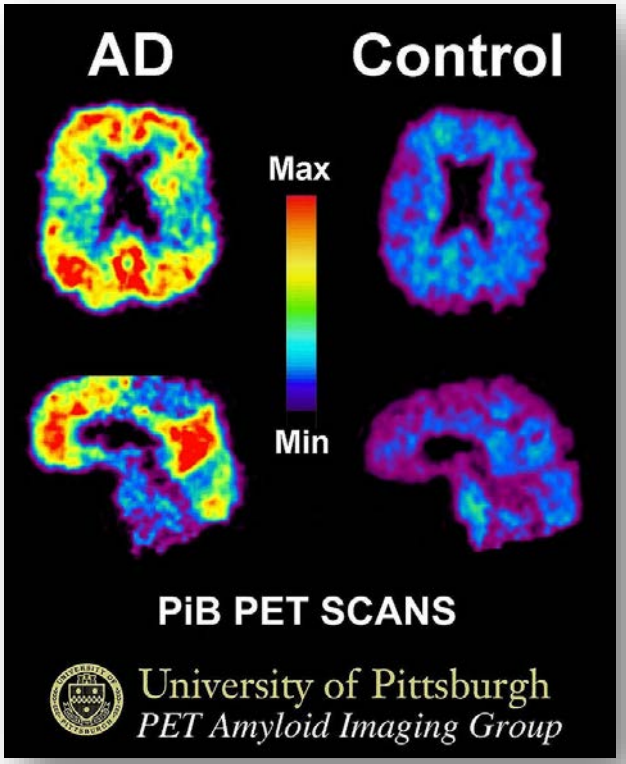
- Cost
- Genotype – Phenotype correlations
- Communication gap – Genetic Counselors
- Variations of unknown significance (average of 3 million per person)
- Data demands
- Ethical and Privacy concerns

#2 – Alzheimer's diagnostics shift the curve

- Question - If you walked into a doctors office *today,* had *no* symptoms, and wanted to know your likelihood of developing Alzheimer's dementia….
  - ….How *accurately* could this be predicted?
  - ….How *long* into the future could we make that prediction?

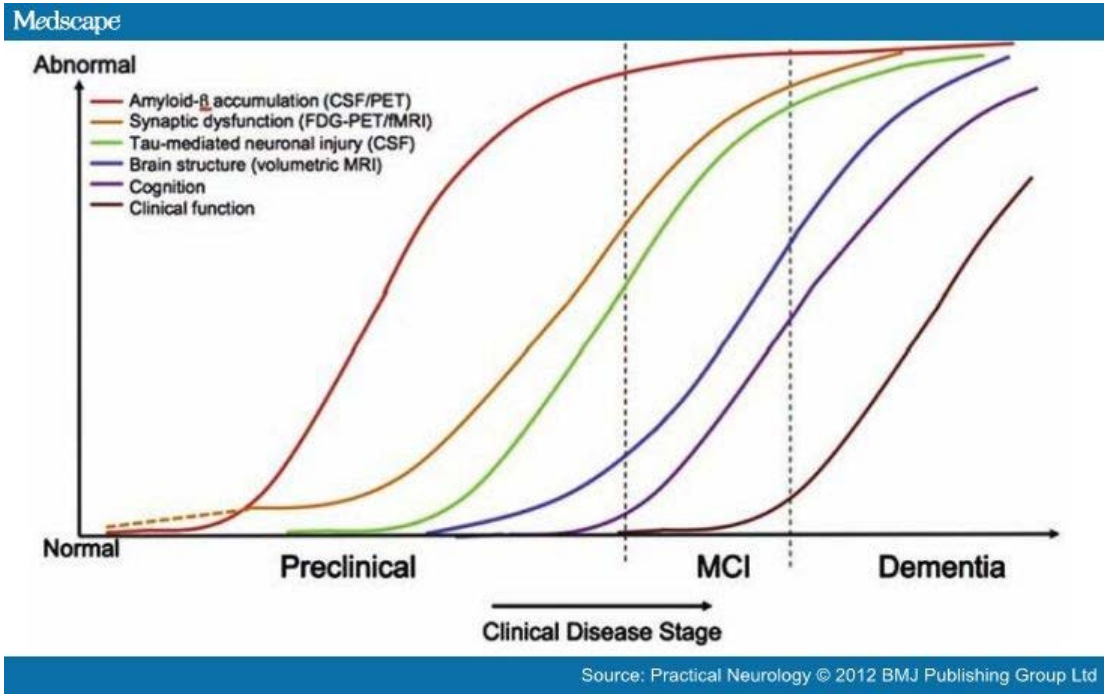
AD Biomarkers





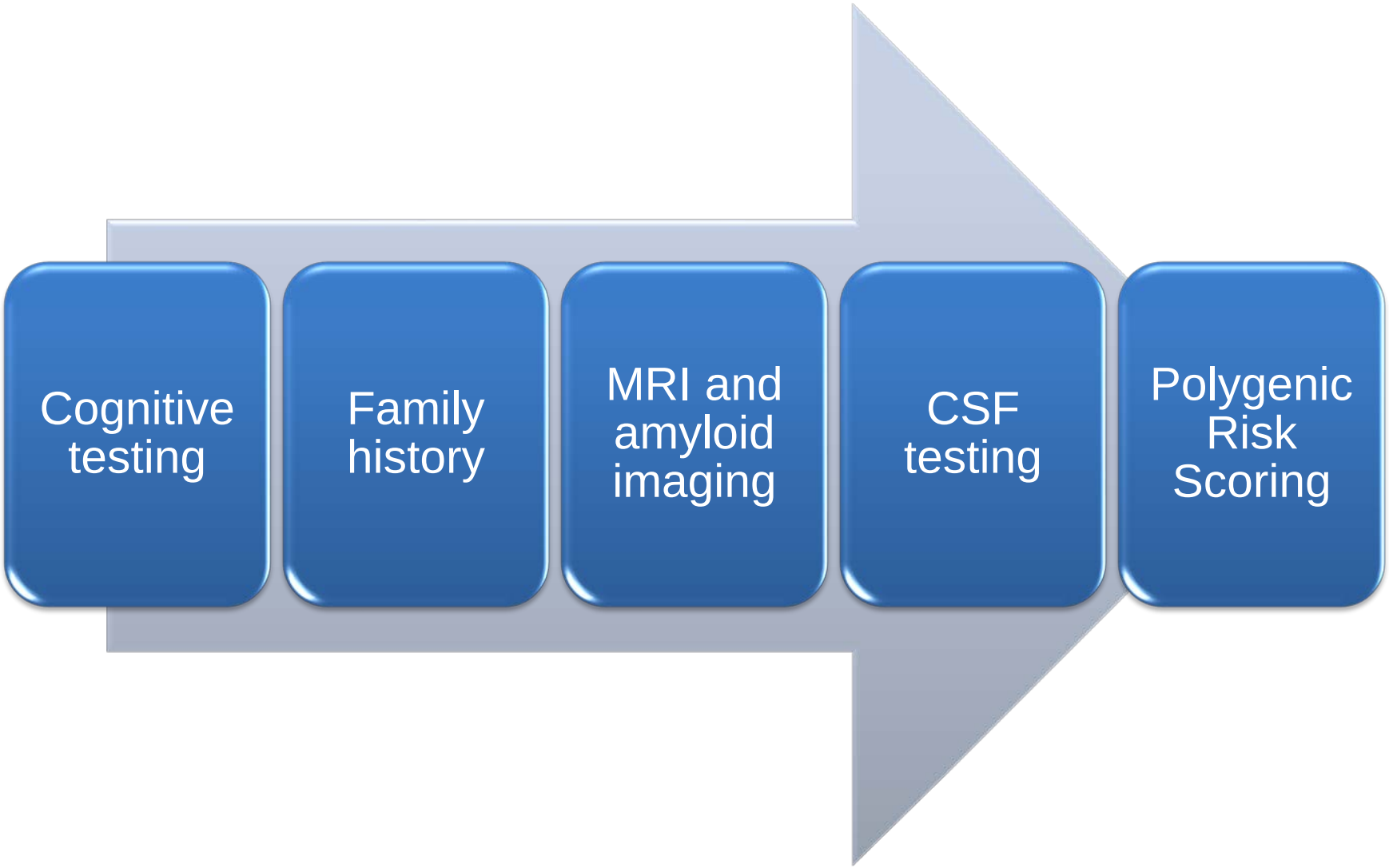
By Klunkwe - Own work, CC BY-SA 3.0, https://commons.wikimedia.org/w/index.php?curid=5470244

Biomarkers and Preclinical Alzheimer's



http://www.medscape.com/viewarticle/761284_5

Alzheimer's Diagnostics

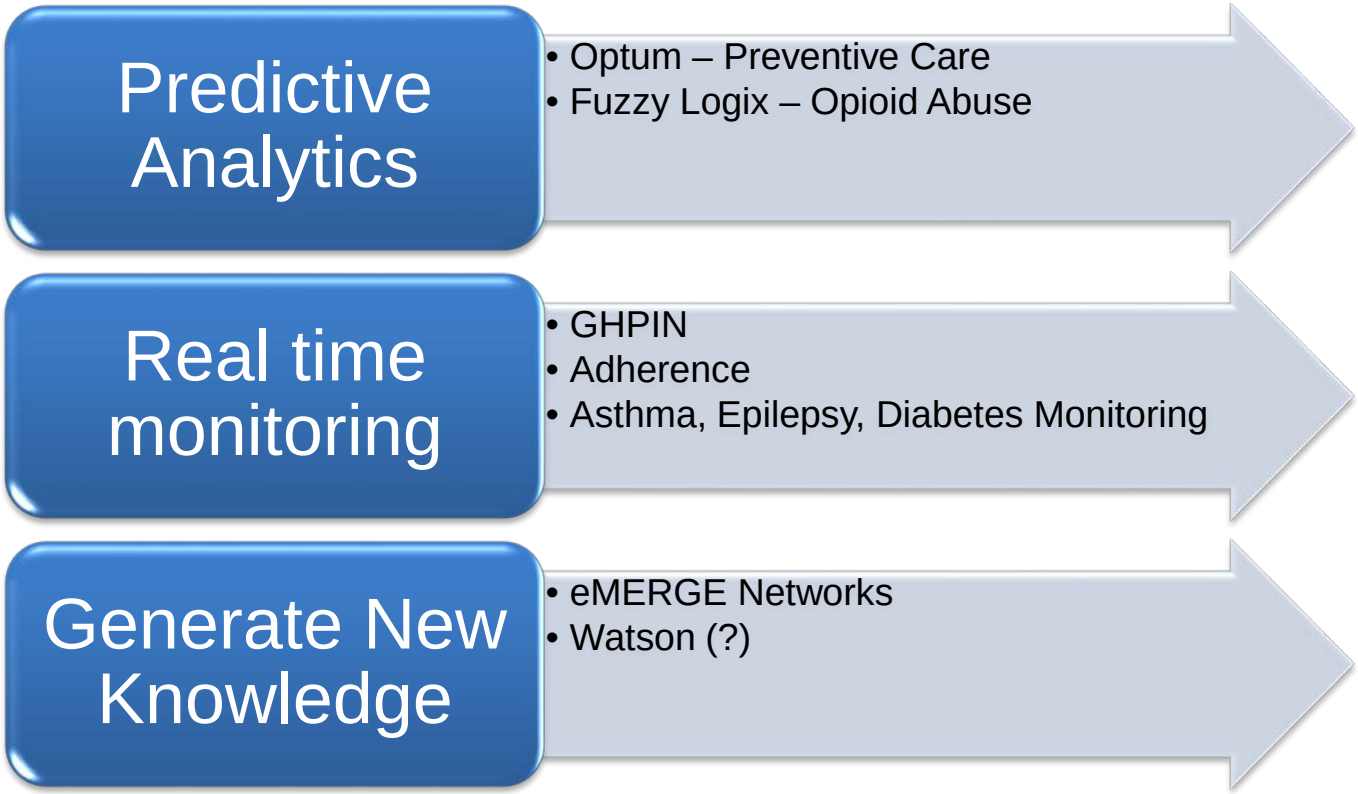


#3: Application of big data to modern medicine

Big Data and Health Care…Limitations…

- 80% unstructured
- Marketing hype tests faith
- Limited Crosstalk and compatibility
- Privacy
- Discomfort with removing human element in healthcare

Big Data and Health Care – In Theory and Practice

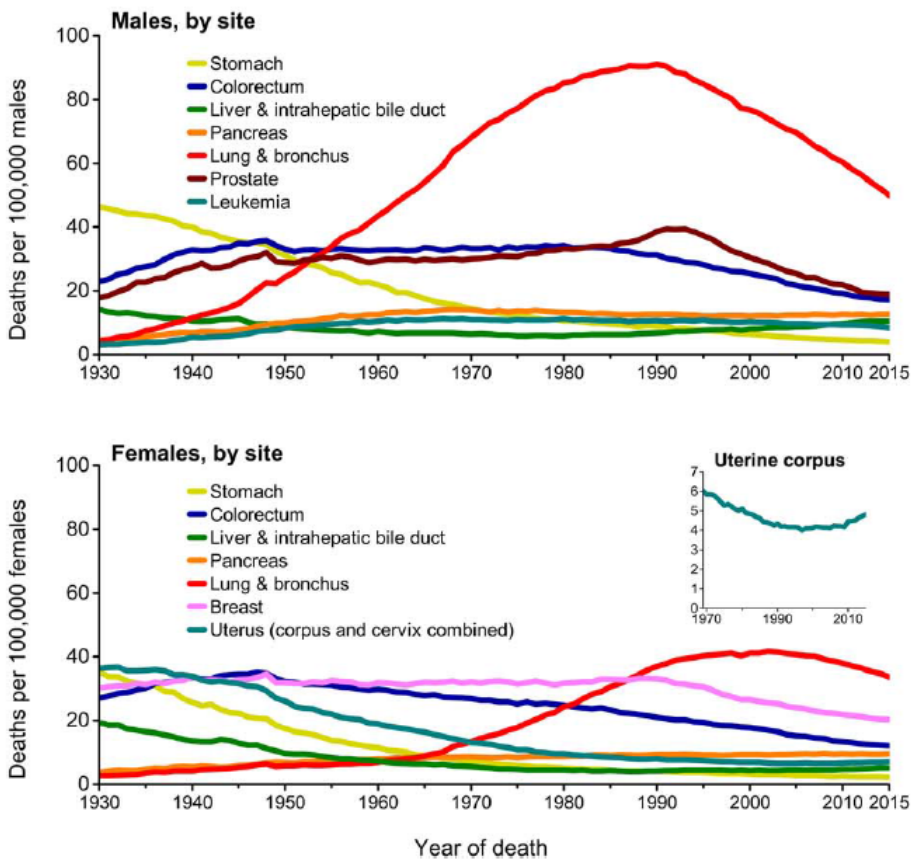


Hypothetical illustration

	Standard	Preferred	Relative mortality
Steps	7,000	10,000	0.83
Activity	0-1x	1-2x	0.86
Inactivity	8+ hrs	6-8 hrs	1.00*
Resting heart rate	70 bpm	60 bpm	0.96
Sleep	6 hrs	7 hrs	0.95
			0.65

#4: Changing tails in cancer

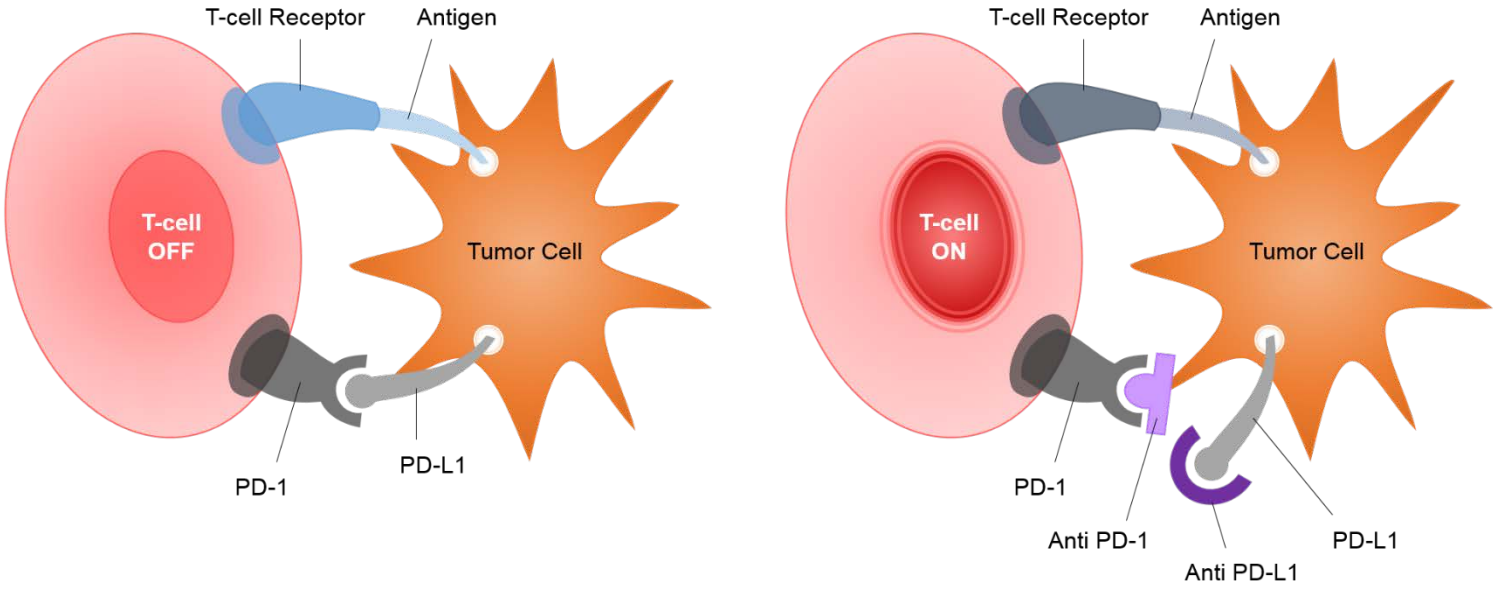
Trends in Cancer Mortality



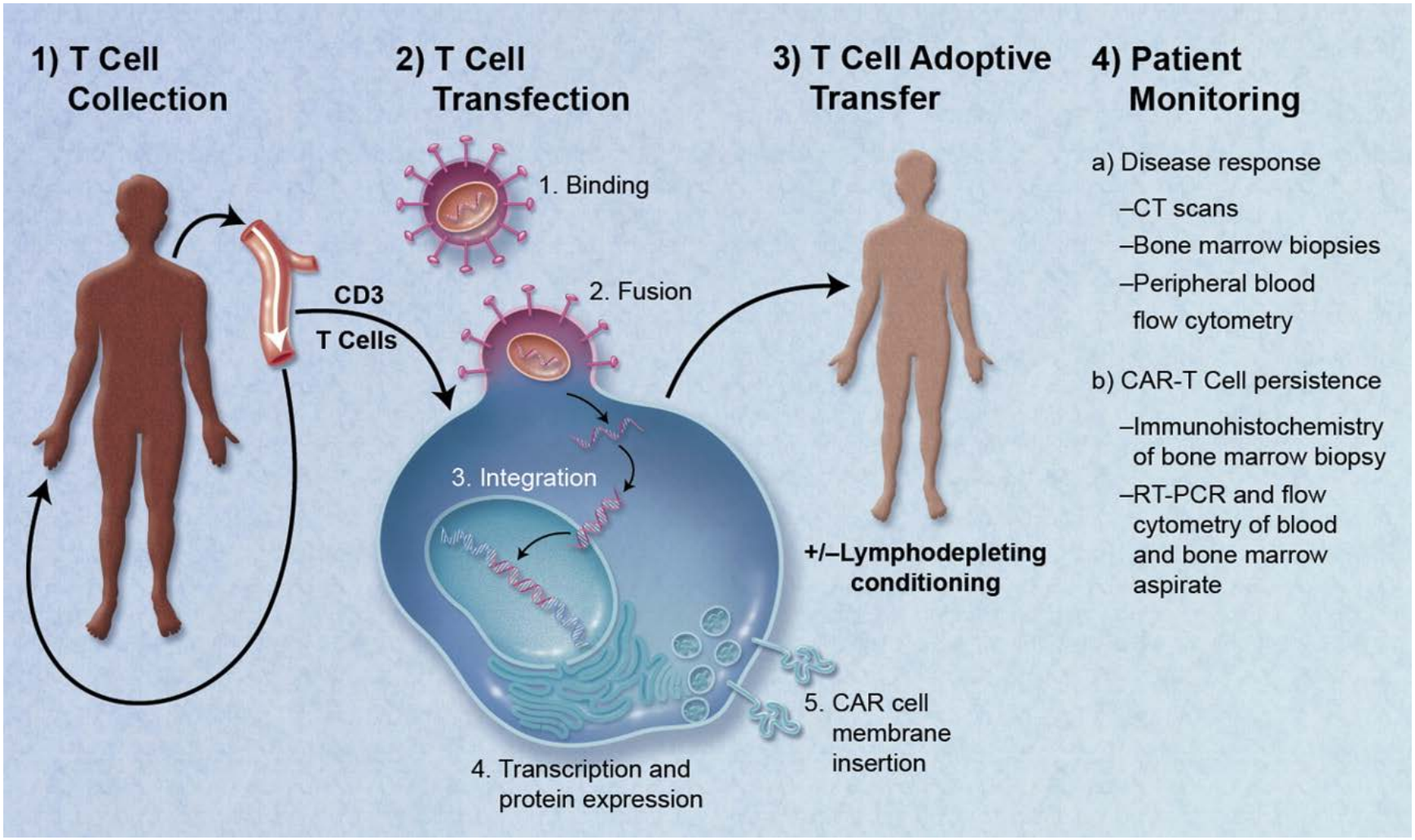
- Overall cancer death rate decreased annually by 1.5% between 2006-2015
- Gains were greater in men than women
- Highest level of declines occurred in lung, breast, prostate and colorectal cancer
- Smaller degrees of rise in death rates of liver cancer, uterine cancer and pancreatic cancer.
- Significant lead time bias for certain cancer (e.g. prostate)

"Cancer Statistics, 2018 - Siegel - 2018 - CA: A Cancer Journal for Clinicians - Wiley Online Library." Accessed January 15, 2018. http://onlinelibrary.wiley.com/doi/10.3322/caac.21442/full.

Immune checkpoint inhibitors



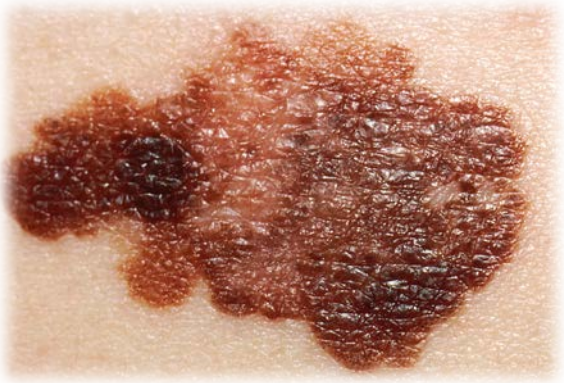
CAR-T Cell Therapy

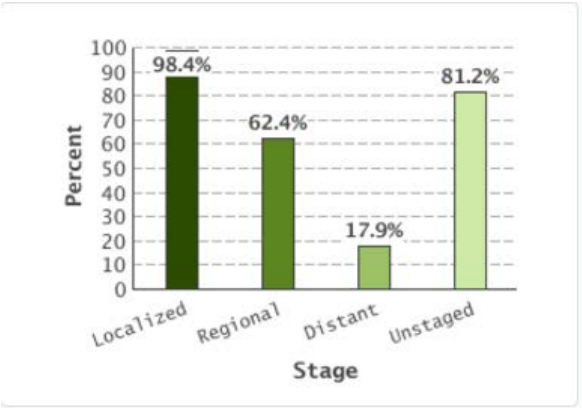


By Caron A. Jacobson and Jerome Ritz [Public domain], via Wikimedia Commons

Late Stage Melanoma Treatment

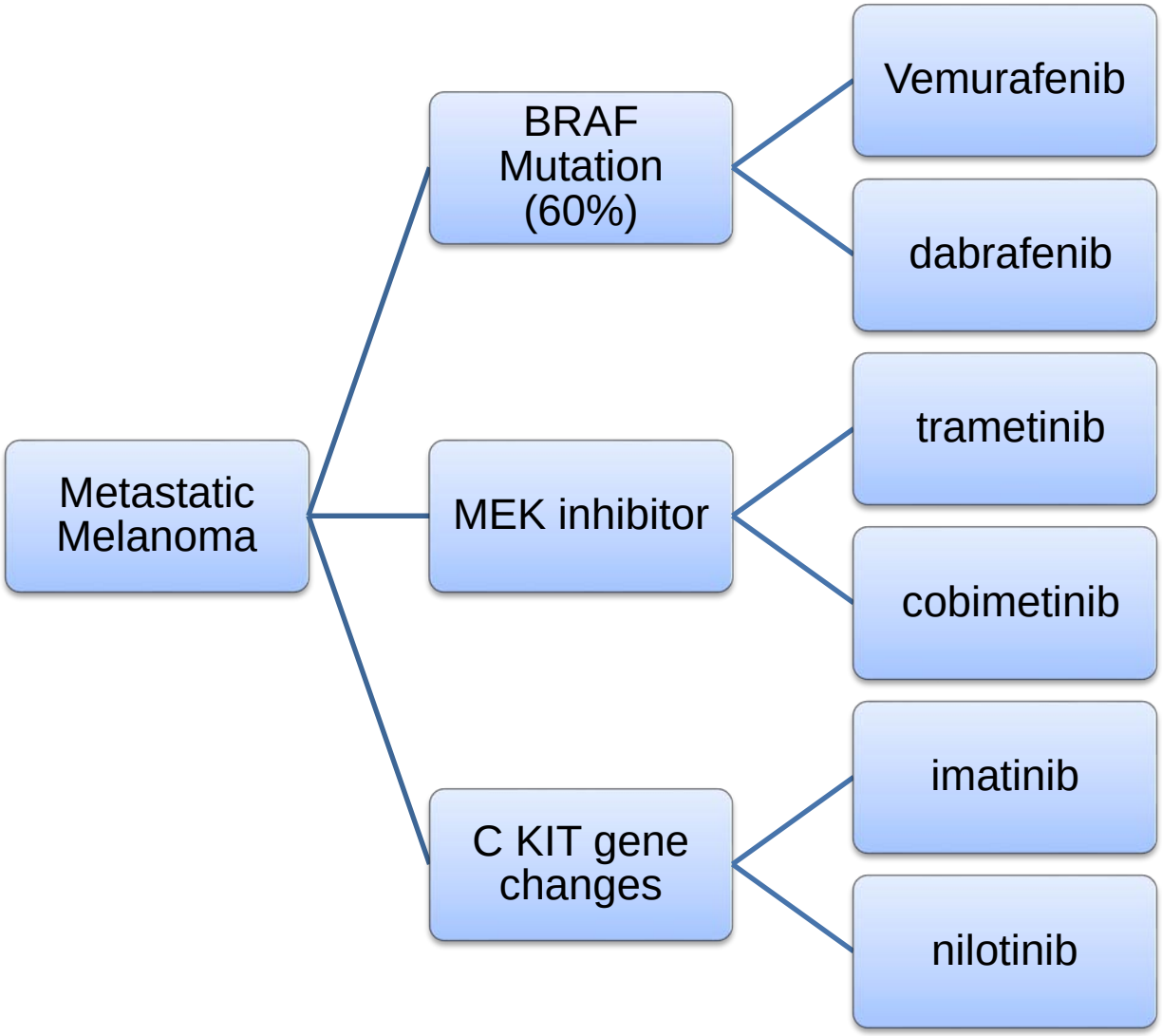
- Prior to recent advances last drugs approved were dacarbazine in 1975 and interleukin-2 (IL-2) in 1988
- Response rate for dacarbazine is around 10% with an 18% overall 5 year survival for stage IV melanoma





https://upload.wikimedia.org/wikipedia/commons/6/6c/Melanoma.jpg Public Domain
https://commons.wikimedia.org/wiki/File:DIG13605-028.jpg Public Domain

Late Stage Melanoma Treatment



Immune Checkpoint Inhibitors

Representative Examples

Medication	Target	Cancer
Nivolumab	PD-1	Melanoma, Non-small cell lung cancer, head and neck cancers, Renal cell, Hodgkin's lymphoma
Pembrolizumab	PD-1	Melanoma, Non-small cell lung cancer, head and neck cancers
Atezolizumab	PDL-1	Urothelial (bladder cancer), Non-small cell lung cancer
Ipilimumab	CTA-4	Melanoma

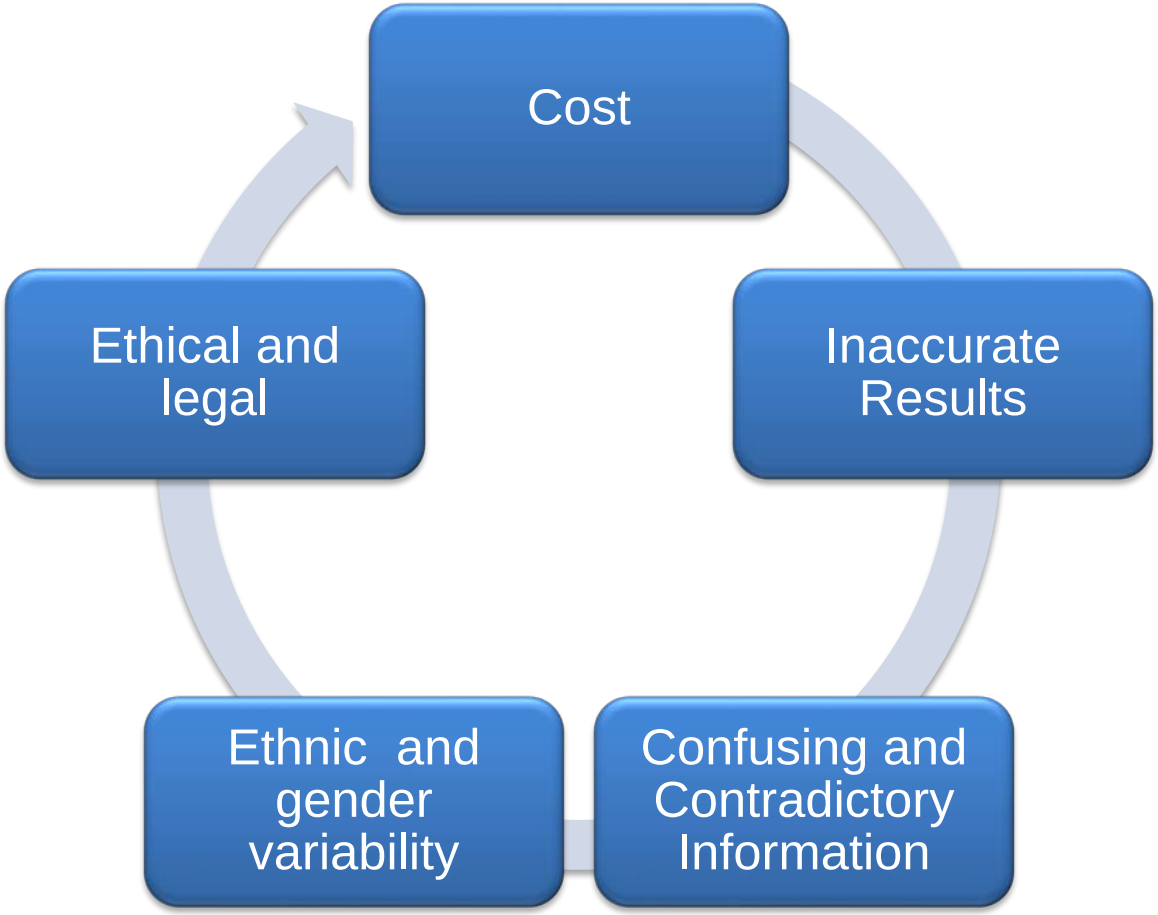
#5 Pharmacogenetics – Sequencing the future of medicine one patient at a time

Pharmacogenetics Use Cases – The Promise

- Proper dosing
- Identifying non-responders
- Cancer treatment algorithms
- Rare disease Treatment
  - Cystic fibrosis
  - Spinal Muscular Atrophy
  - Muscular dystrophy

Barriers and Challenges – The Reality

Are we back where we started?



Pharmacogenetic Product Applications

Offering as a benefit

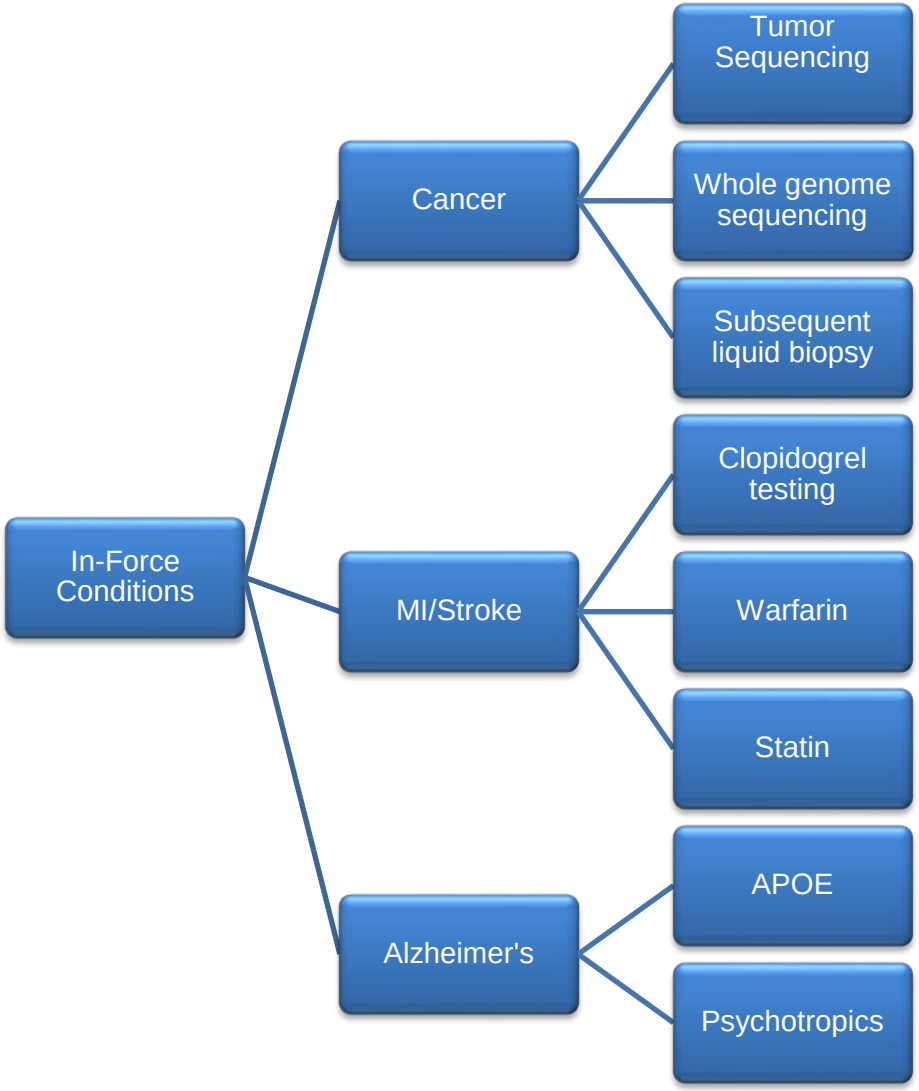
- Are seeing offering internationally similar to a wellness benefit
  - In force management/Risk factor modification
  - Reduce lapse rates
- Seeing paired with third party or “capped” benefit
- Nutrigenomics being offered as well
- Increasing interest in LTC and group space

Pharmacogenetic Product Applications

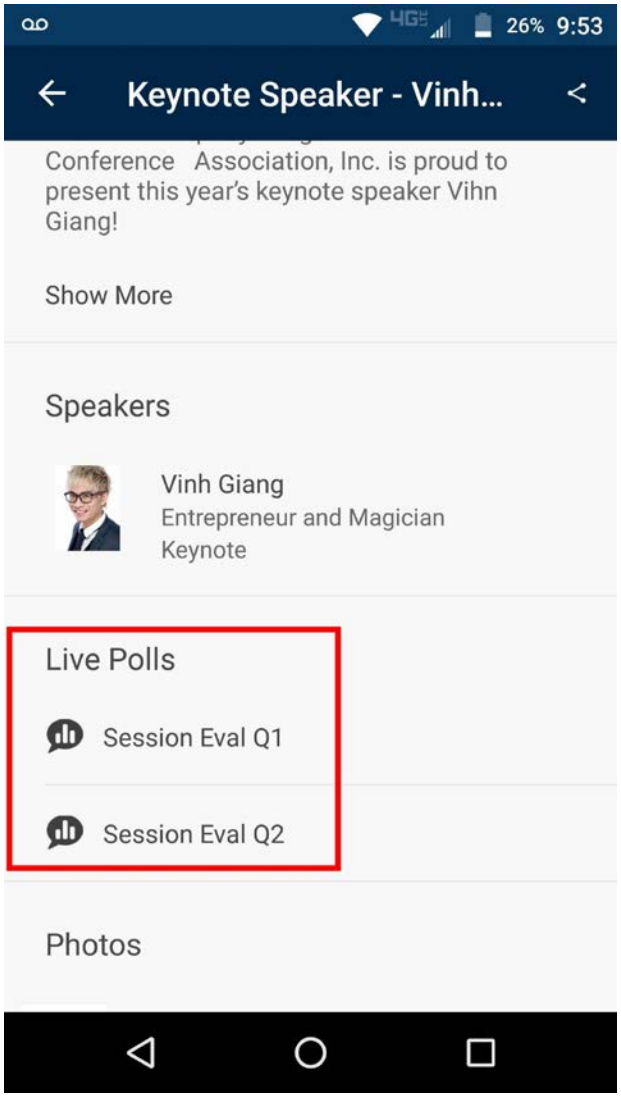
- LTC – Adverse medication reactions and polypharmacy are a big driver of loss of independence.
- Individualized Rating/Pricing: Instead of now "lumping" this individual back into a Flat extra model, is individualized pricing based an *individualized* recurrence risk score on the horizon?
- Dynamic Rating/Pricing: Post issue, if one now has follow up testing such as liquid biopsy that changes this recurrence risk can they be dynamically priced?

LTC Pharmacogenetic Benefits

A good marriage?



Session Survey Instructions



Once you are in the app go to the schedule and the session you are in.

Scroll to the bottom to find the Live Polling questions.

This year the session survey questions can be found in this section and will take just a couple seconds to complete.

Questions

THANK YOU!

Dave Benz, david.benz@ge.com
Chris Giese, chris.giese@milliman.com
Dave Rengachary, drengachary@rgare.com
Al Schmitz, al.schmitz@milliman.com