FINANCIAL PLANNING ASSOCIATION
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The Value of Personalized Longevity Projection for Retirement Income

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Background

Expected lifespans vary significantly across time and individuals!

- Life expectancy at birth rose from **68.2 years in 1950** to **78.8 years in 2019** (CDC, National Center for Health Statistics)
- Life expectancy was **68.6 years for male American Indians** and **87.4 years for female Asian Americans in 2019** (CDC).
- Current smokers' life expectancy was 10 years lower than individuals who had never smoked (Jha, 2013).
- Chetty et al. (2016) found significant disparities in race-adjusted life expectancy by income and geography.
  - Low-income men: ranges from **72.3 to 78.6 years** (across New York, San Francisco, Dallas, and Detroit)
  - High-income men: ranges from **86.5 to 87.5 years** across the same cities

Problem

- Financial advisors today typically rely on:
  - **Monolithic lifespan assumptions**.
    - Blanchett (2021) analyzed 32,711 financial plans:
      - 70% assumed a survival age of 90, 20% assumed 95
      - Very little customization, even across gender
  - **Clients' Subjective Life Expectancy Estimates**.
    - Research shows a systematic "flatness bias" (Ludwig et al., 2013; Heimer et al., 2019):
      - Younger individuals tend to underestimate how long they'll live
      - Older individuals tend to overestimate their survival

Using uniform life expectancy assumptions (or inaccurate estimates) can cause errors in financial planning.

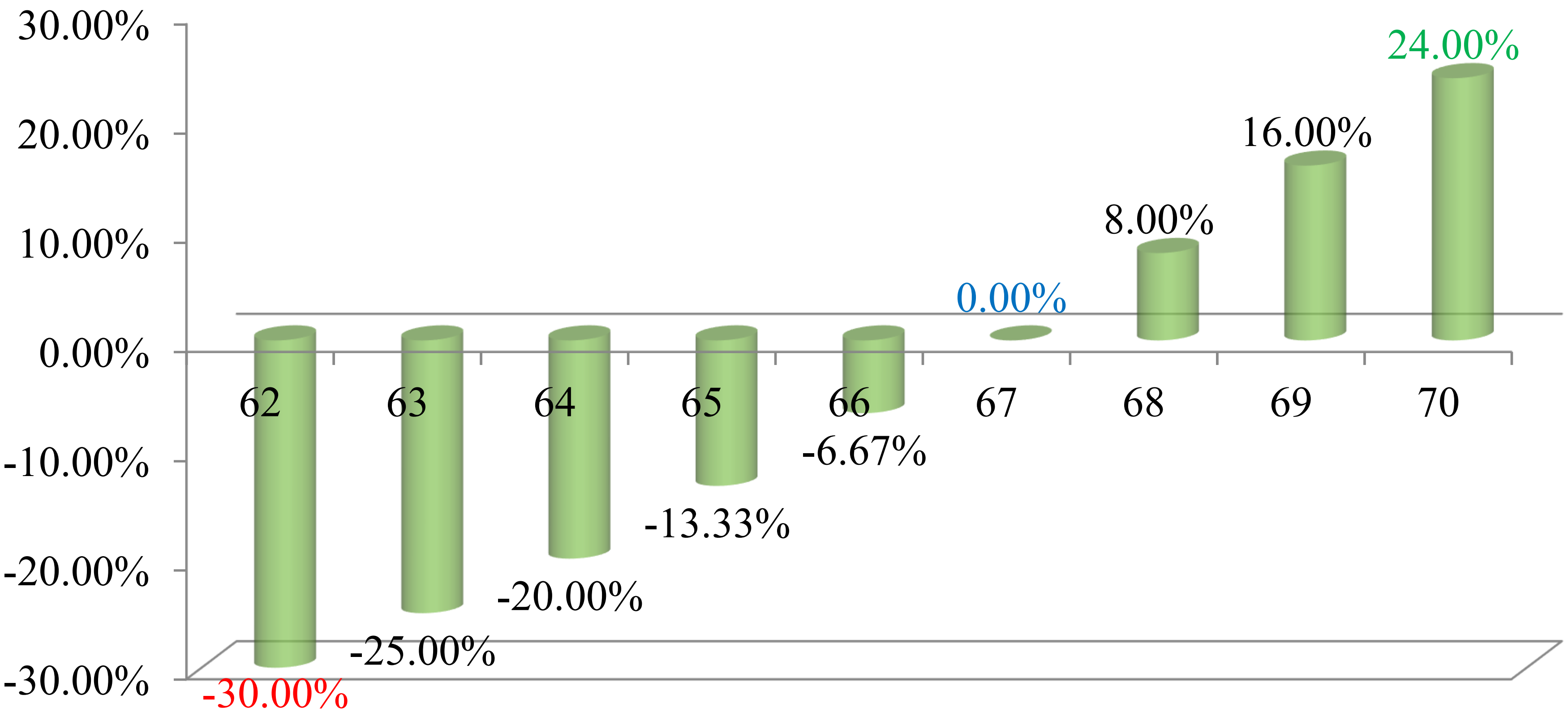
- **Overestimate withdrawal rates for clients likely to live longer.**
- **Underestimate withdrawal rates for clients with shorter life expectancies.**

Research Question

What is the dollar value of personalized lifespan estimates in retirement planning?

- **Social security benefit claiming as context**
  - Decision amenable to quantification
  - 92% of retirees claim social security benefits (SSA, 2023)
  - Social security can make up 37% to 61% of retirees' income, on average, depending on income level and with/without Pension) (Retirement Research Center, 2022)
- **$2000 PIA = per month benefit at FRA (e.g., age 67):**
  - $1400 per month benefit (70% of PIA) at age 62
  - $2480 per month benefit (124% of PIA) at age 70
- **Individuals with short expected lifespan should claim early, while individuals with long expected lifespan should claim late.**
  - While past study account for factors such as taxation, spousal benefits, and program rules, they often apply **simplified, uniform life expectancy assumptions across all individuals** (Kotlikoff & Ye, 2022).

Early or Delayed Retirement – **FRA of 67**



Preview of Findings

Analyze HRS data:

- Use demographic & health attributes to predict lifespan (as of age 62) and compute optimal claiming age
- Observe death age of respondent
- Compute realized value of benefits for various claiming ages

Personalized claiming increases value of social security benefits by an average of >$9K for women and >$12K for men relative to benchmark claiming ages!

Does it Pay to Delay?

- Altig, Kotlikoff, and Ye (2022) find that 90% of US workers should wait until age 70 to claim, **but they assume that all will live until age 100!**
- Shoven and Slavov (2014) find that most US workers should delay claiming even when considering variation by race, education, and health status.

Other Related Literature

Personalization:

- Aboagye et al. (2024) find that target-date funds with personalized glide paths can improve lifetime spending by 3% to 9%.
- Benartzi (2025) finds that holistic financial advice (personalized over savings, debt, insurance, and investments) has a value of $4,400 per year for middle-class households.

Social Security Claiming:

- Diamond et al. (2021) argue that households with sufficiently high wealth to PIA ratio should claim social security late in order to smooth consumption.
- Bronshtein et al. (2020) argue that individuals who purchase a retail-priced annuity should not claim social security early.

Data

Health and Retirement Study (HRS) (University of Michigan)

- Nationally representative sample of adults over age 50
- 15 biennial waves: ‘92, ‘94, …, ‘20
- Survey items cover demographics, health, finances, etc
  - **Demographics**: birth year, gender, race, ethnicity, marital status, etc.
  - **Health:** self-rated health, current & former smoker status, chronic conditions, etc.
  - **Finances**: asset values, income, insurance, expenditures, etc.
- Longitudinal data (tracking individuals over time) with 41,406 respondents

Data

- 41,406 respondents
  - Randomized half (20,703) as the training sample, the other half (20,703) as the testing sample
- Near-identical distributions for all the key variables to ensure that the model is trained and evaluated on comparable populations.

Table 1: Summary statistics for both Training and Testing groups

	Training	Testing
Lifespan (based on actual observed sample, 8,992 observations in Training group, 8,957 observations in Testing group)		
Minimum (years)	32	34
Mean (years)	79.67	79.31
Median (years)	81	81
Maximum (years)	112	111
Standard Deviation	11.25	11.28
Gender		
Female	55.84%	56.24%
Male	44.16%	43.76%
Race		
White	72.32%	72.85%
Black	19.10%	19.04%
Others	8.58%	8.11%
Ethnicity		
Hispanic	12.52%	12.26%
Non-hispanic	87.48%	87.74%
Education		
Less than high school	25.51%	25.23%
High School/GED/Some College	55.50%	55.46%
College and above	18.99%	19.31%

Model

The mortality rate for individual *i* at age *t* is given by the Cox Proportional Hazards (Cox PH) model:

$$\lambda_t(x_{i,t}) = \lambda_0(t) \cdot exp[(x_{i,t} - \mu_x)^T \beta]$$

- The baseline mortality rate **($\lambda 0$ (t))** comes from SSA lifetables by gender.
- We estimate the model on half of respondents (training sample) and test it on half of respondents (test sample).
- Covariates are captured by the **(x(i,t))** and include race, ethnicity, education, self-rated health status (excellent, very good, good, fair, or poor), and current and former smoker status.
- The exponential term **($exp[(x(i,t)-\mu x$)^T*β])** represents the ratio between the individual's mortality rates and the population average.

Model Estimates

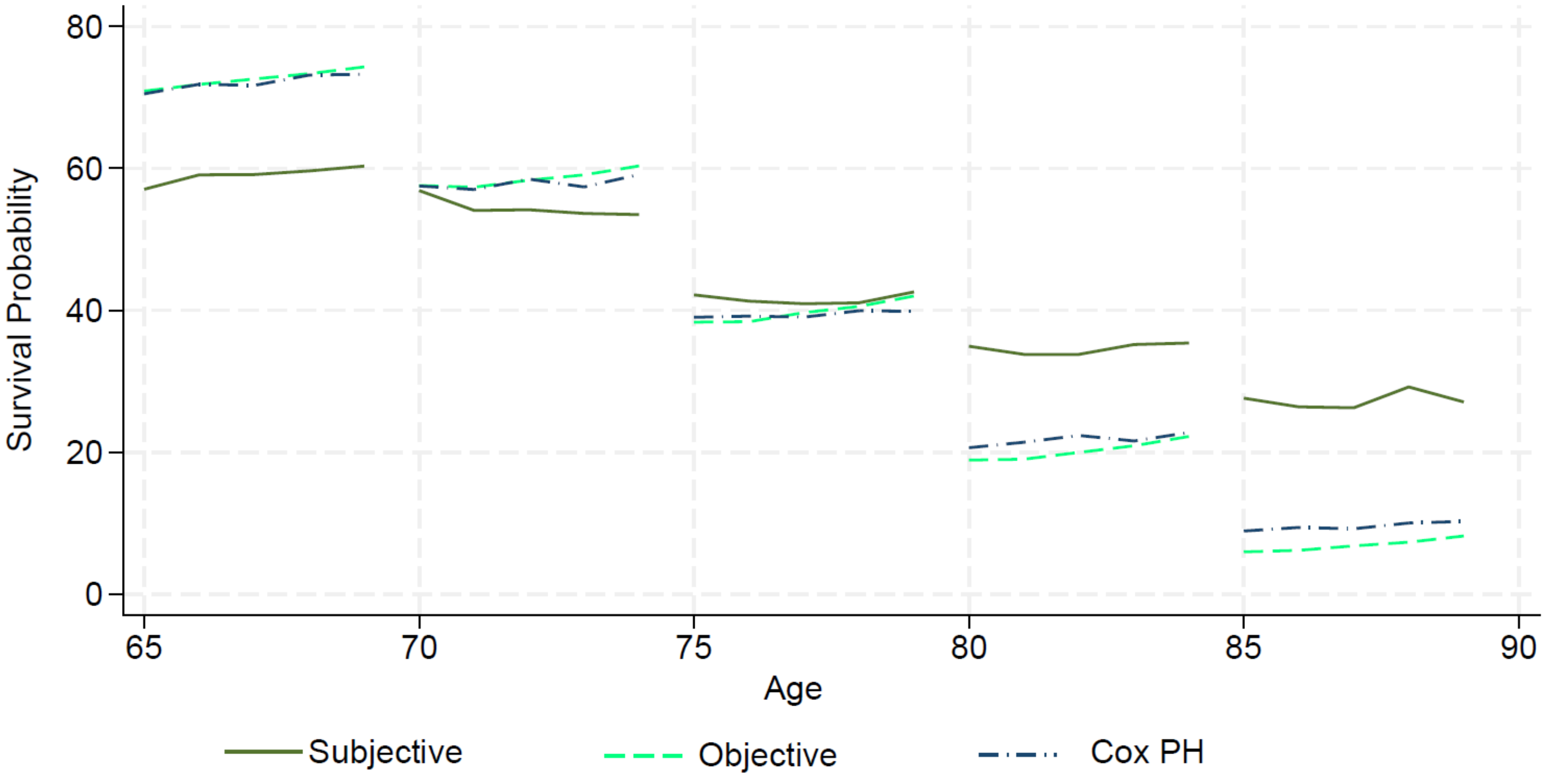
- Smoking increases mortality rates by 68% for males and 54% for females.
- Fair/poor health increases mortality rates by 128% for males and 123% for females.

Table 2: Cox Proportional Hazard Model Coefficient Estimates by Gender

	Male		Female	
Covariate	Hazard Ratio (95% CI)	P-Value	Hazard Ratio (95% CI)	P-Value
Black	1.02 (0.93 - 1.11)	0.67	0.96 (0.89 - 1.03)	0.27
Other race	0.91 (0.78 - 1.07)	0.25	0.93 (0.79 - 1.09)	0.37
Hispanic	0.73 (0.65 - 0.83)	<0.005	0.68 (0.60 - 0.76)	<0.005
Less than high school	1.01 (0.94 - 1.08)	0.79	1.09 (1.03 - 1.17)	0.01
College or more	0.85 (0.78 - 0.93)	<0.005	0.90 (0.82 - 1.00)	0.04
Excellent/very good health	0.66 (0.60 - 0.73)	<0.005	0.65 (0.59 - 0.72)	<0.005
Poor/fair health	2.28 (2.12 - 2.45)	<0.005	2.23 (2.08 - 2.40)	<0.005
Current smoker	1.68 (1.53 - 1.84)	<0.005	1.54 (1.40 - 1.69)	<0.005
Ever smoker	1.22 (1.13 - 1.31)	<0.005	1.32 (1.24 - 1.41)	<0.005

How Do Perceived and Predicted Survival Probabilities Compare?

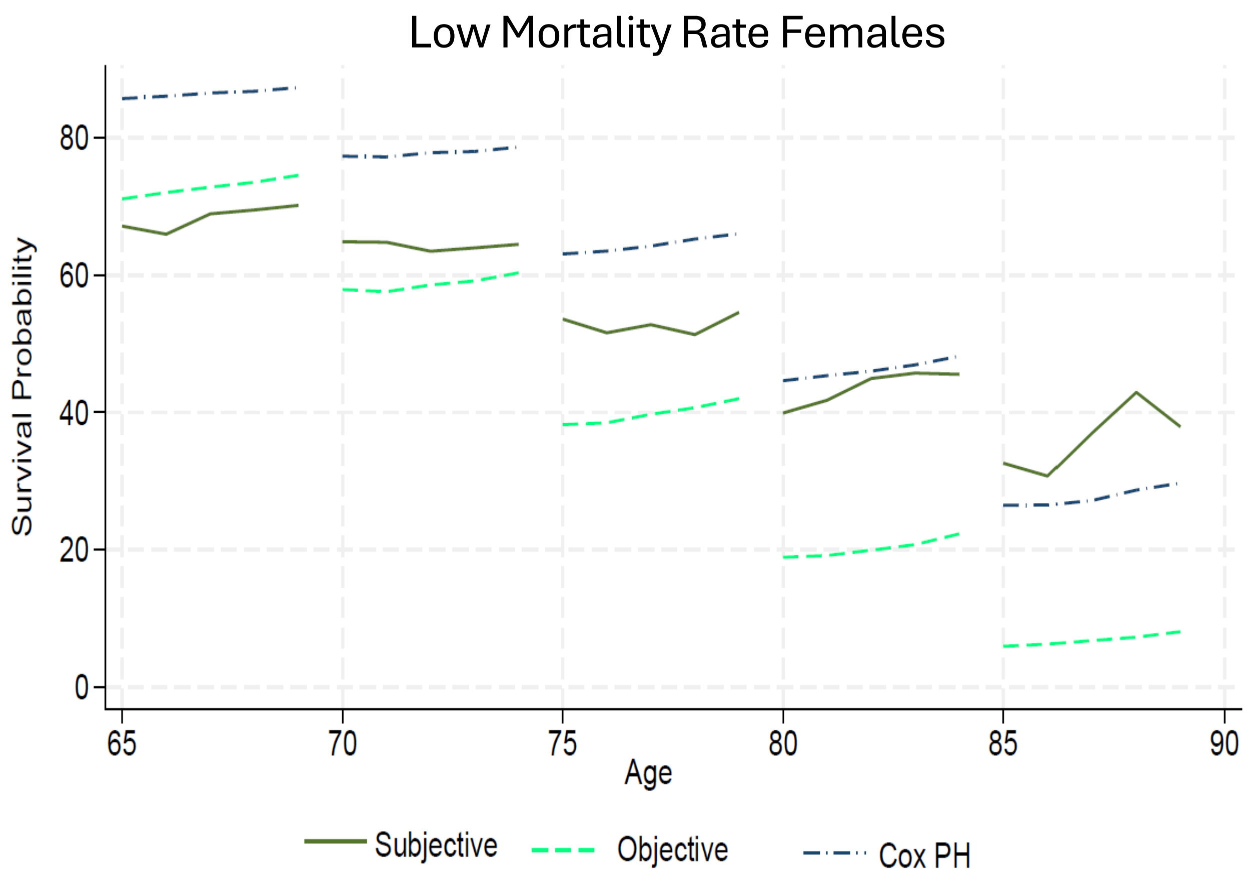
A visual representation of flatness bias



Subjective vs. Objective survival Rates: All Females (Test Sample)

Survey respondents exhibit "flatness bias" in survival estimates.

- Younger respondents (age 65-74) **underestimate** future survival probability.
- Older respondents (age 80-89) **overestimate** future survival probability.



- “High mortality” defined as hazard ratio **> 1.8** (**23%** of sample).
- High mortality respondents generally report **lower** survival rates.
- Respondents **overestimate** their survival rates relative to personalized Cox PH rates (except from age 65-69).

- “Low mortality” defined as hazard ratio **< 0.54** (**20%** of sample).
- Low mortality respondents generally report **higher** survival rates.
- Respondents **underestimate** their survival rates relative to personalized Cox PH rates (except from age 85-89).

Model Accuracy

- Standard method for binary classification models (death or survival in each year)

$$log\ (L) = -\frac{1}{N}\sum_{i}\left[\frac{1}{E_i - S_i + 1}\sum_{t=S_i}^{E_i} y_{i,t} log\ (\lambda_t(x_{i,t})) + (1 - y_{i,t}) log\ (1 - \lambda_t(x_{i,t}))\right]$$

- *i* is the index for individuals in our test sample.
- *t* is the age of the individual ranging from some start age (S_i) at which they are first observed to some end age (E_i) at which they either die or drop out of the sample.
- **$y_{i,t}$ is the observed event for individual *i* at age *t* – equal to 0 if they live through age *t* and 1 if they die at age *t*.**
- $x_{i,t}$ is a set of demographic and health attributes for individual *i* at age *t*.
- λ_t is the mortality rate at age *t* associated with these attributes

Model Accuracy

- Standard method for binary classification models (death or survival in each year)

Table 3: Average Log Loss by Model

	Male	Female
Cox PH Model	1.58	1.36
SSA Model	1.63	1.41

- **Log loss** captures the degree of error in models which predict binary outcomes – e.g., **life and death**.
- It penalizes a **low mortality rate** (probability of death) when the **individual dies**.
- It also penalizes a **high mortality rate** when the **individual survives**.
- Our model error is lower than the error using the SSA cohort lifetable in our test sample.

$$log\ (L) = -\frac{1}{N}\sum_{i}\left[\frac{1}{E_i - S_i + 1}\sum_{t=S_i}^{E_i} y_{i,t} log\ (\lambda_t(x_{i,t})) + (1 - y_{i,t}) log\ (1 - \lambda_t(x_{i,t}))\right]$$

Assumptions

- **Social Security Benefit:**
  - PIA = full retirement age benefit (at 67) of $40,000
  - Same benefit parameters across respondents to isolate the effect of expected lifespan
- **Baseline mortality rates and claiming rules:**
  - SSA cohort lifetables by gender for birthyear = 1960
    - Due to survivorship bias in the sample with low mortality rate
  - Benefit adjustments (delays/credits) for birthyear 1960 or later
    - Up to 30% permanent penalty (62) and 24% permanent credits (70).
- **Discount Rate:**
  - 3% real interest rate, consistent with long-run historical averages (Shoven and Slavov (2014))

Algorithm

- For individual *i* in test sample:
  - Compute Cox PH mortality rates and expected lifespan from covariates (demographic & health attributes) at latest age up to 62
  - Compute expected present value for claiming ages 62 -70 and identify optimal age with highest value
  - Observe death age and compute realized value of benefits for optimal claiming age vs. benchmarks (62, 67, 70, and SSA lifetable optimum)
- Average realized values across individuals in test sample!

Case Study-Two real persons from HRS

- Person 1 (long lifespan):
  - white male, very good health, current non-smoker, past smoker
- Person 2 (short lifespan):
  - black female, poor health, current smoker, past smoker
- SSA cohort table projections:
  - Person 2 projected to live longer and claim later than person 1 because of gender
- Cox PH model projections:
  - Person 1 projected to live longer and claim later than person 2 because of health factors
- Cox PH model results in $8K more for person 1 from late claiming and $132K more for person 2 from early claiming!

Table 4	Person 1	Person 2
Gender	Male	Female
Race	White	Black
Education	Non-College	Non-College
Health Condition	Very Good	Poor
Smokes at age 62	No	Yes
Ever Smoked	Yes	Yes
Death Age	86	68
Results Estimated by SSA Baseline Mortality Rate		
Median lifespan	85	88
Optimal claiming age	66	69
PV of realized life benefits	$526,658	$0
Results Estimated by Cox PH Model Mortality Rate		
Median lifespan	89	76
Optimal claiming age	69	62
PV of realized life benefits	$534,451	$132,078

Average Dollar Value

Table 5: Average Realized Present Value of Lifetime Benefits on Test Sample

	Females	Males
Minimum Claiming Age (62)	$441,457	$393,068
Full Retirement Age (67)	$456,335	$393,985
Maximum claiming age (70):	$458,658	$386,531
Baseline optimal claiming age	$462,273	$399,103
Cox PH optimal claiming age	$467,943	$405,349
# of Test Sample	11,924	9,278

- Men gain an average of $18.8K (= $405.3K - $386.5K) while women gain $9.3K (≈ $467.9K - $458.7K) relative to claiming at age 70.
- Men gain an average of $12.3K (≈ $405.3K - $393.1K) while women gain $26.5K (≈ $467.9K - $441.5K) relative to claiming at age 62.
- Men gain an average of 2.9% (=$405.3K/$394.0K-1) while women gain 2.5% (=$467.9K/$456.3K-1) relative to claiming at full retirement age.

Robustness check on subsample of High-Net-Worth Households

Table 6: Average Realized Present Value of Lifetime Benefits on High Wealth Respondents in Test Sample

	Females	Males
Minimum Claiming Age (62)	$485,978	$437,867
Full Retirement Age (67)	$514,491	$451,009
Maximum claiming age (70):	$522,821	$450,075
Baseline optimal claiming age	$524,585	$455,730
Cox PH optimal claiming age	$526,327	$460,266
# of Test Sample	2778	2344

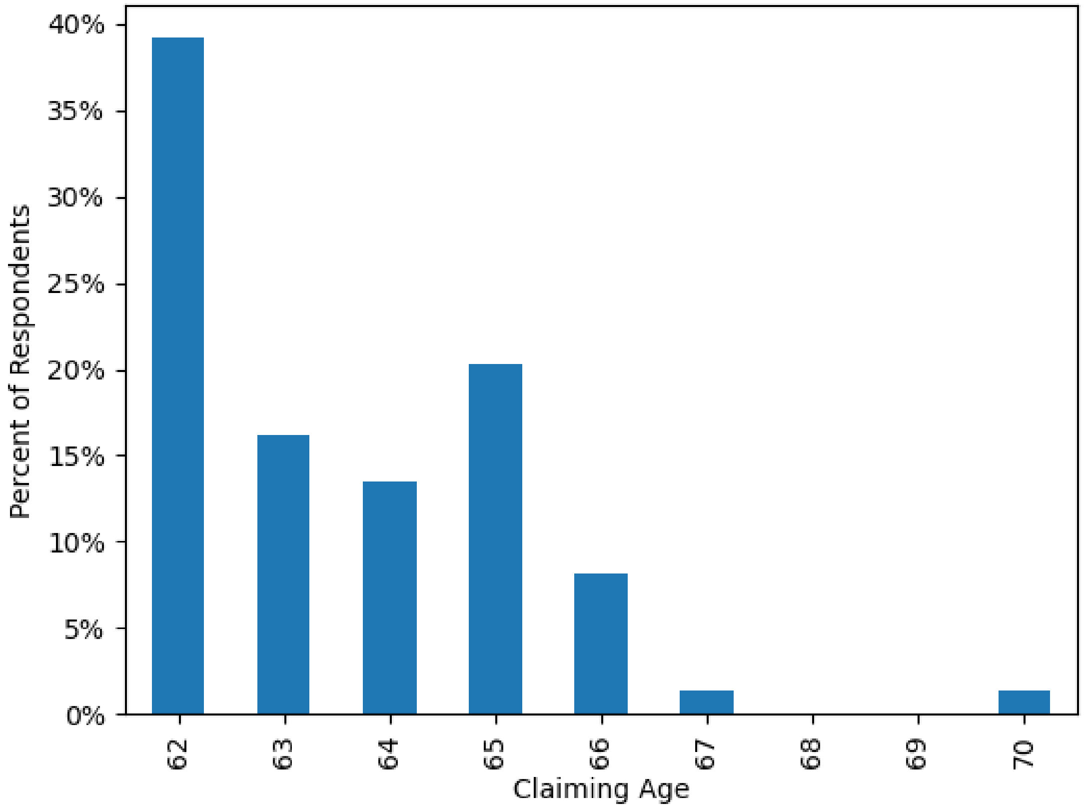
- Cox PH optimal claiming age still provides highest present value for both genders.
- Men gain an average of $9.3K (=$460.3K - $451.0K), while women gain $11.8K (=$526.3K - $522.8K) relative to claiming at full-retirement age.

Many households cannot afford to postpone Social Security benefits.

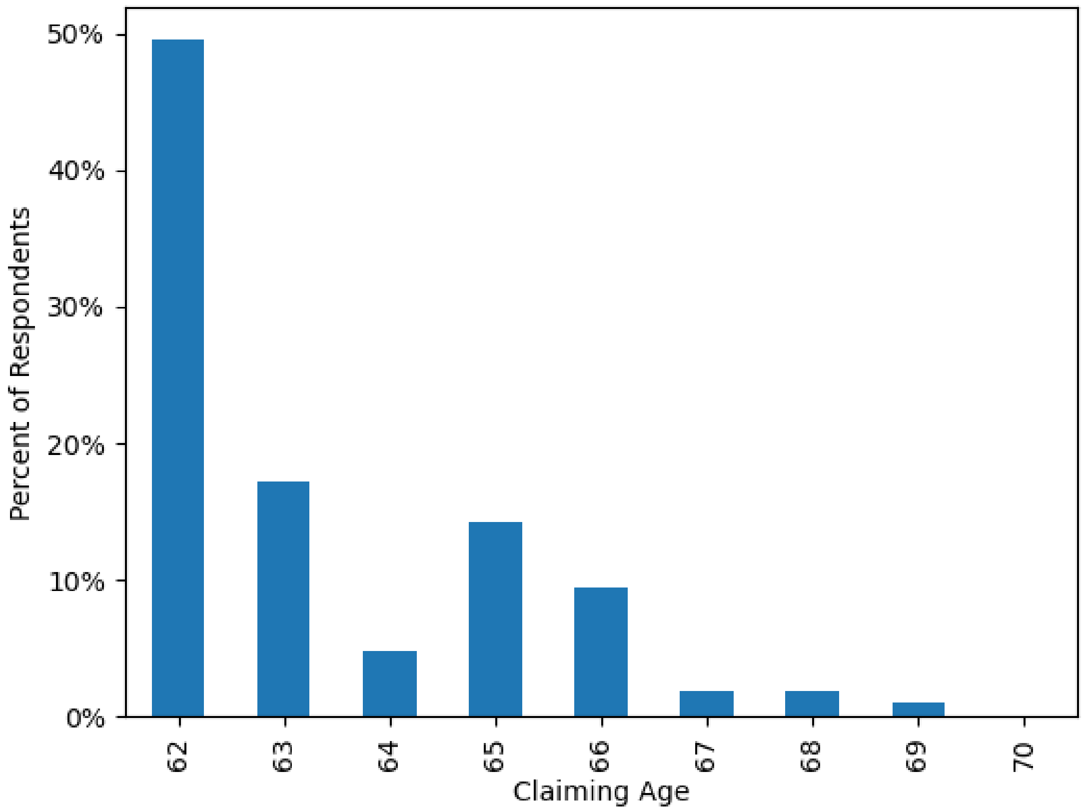
- What happens to gains if we only consider respondents with higher wealth who can afford to postpone claiming?
- We filter out respondents with financial assets net of debt of less than **$200K** in terms of 2020 dollars!
- 34.9% of males (2344 of 9278) and 31.8% of females (2778 of 11,924) in our test sample have wealth greater than or equal this threshold.

The Distribution of Actual Social Security Claiming Age (based on filtered sample of 105 females and 74 males)

Male



Female



- We include only respondents:
  - with valid reported claiming ages between 62 & 70
  - who were "never married" through age 62
- 105 females and 74 males remained in our test sample after applying these filters.

Average Dollar Value with Actual Claiming Ages

	Females	Males
Minimum Claiming Age (62)	$512,223	$477,617
Full Retirement Age (67)	$523,417	$473,337
Maximum claiming age (70):	$499,808	$444,905
Actual claiming age	$518,047	$483,242
Optimal claiming age (SSA mortality rate)	$530,453	$485,332
Optimal claiming age (Cox PH mortality rate)	$534,632	$493,582
# of Actual Claiming Age Sample	105	74

- Cox PH optimal claiming age still provides highest present value for both genders – even relative to actual claiming ages.
- Men gain an average of $10.4K (=$493.6K - $483.2K), while women gain $16.6K (=$534.6K - $518.0K) relative to actual claiming age.

Conclusion

- Personalized longevity estimates increase average lifetime Social Security benefits by $9,000 for women and over $12,000 for men, compared to benchmark claiming ages.
- Personalized longevity:
  - Enables more tailored retirement strategies, improving the precision and economic value of financial planning.
  - Serves as an educational opportunity for advisors to boost client engagement by illustrating the tangible benefits of individualized assumptions.

Social Security Optimization Apps

- ShoreUp Retirement Solutions has a free online social security calculator for individuals based on personalized lifespan projection:

  https://shoreupretire.com/services

- Income Conductor offers a social security optimizer based on personalized lifespan projection from Healthview.
- Other financial planning software (e.g., Income Lab) allows planners to input client lifespan assumptions into social security optimizers.

ShoreUp

Lifespan Projection Sites

- Society of Actuaries Longevity Illustrator:
  https://www.longevityillustrator.org/
- UConn Goldenson Center Healthy Life Expectancy Calculator:
  https://apps.goldensoncenter.uconn.edu/HLEC/
- Northwestern Mutual Lifespan Calculator:
  https://media.nmfn.com/tnetwork/lifespan/index.html#0