Estimating the Contribution of Demographic Change to Medicare Spending based on Age, Sex, and Time-To-Death

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Outline

1. Historical demographic data by age & TTD

2. Historical contribution of demographic change to growth in Medicare spending per enrollee

    – Current method (Age-Sex)

    – Alternative method (Age-Sex-TTD)

3. Projecting contribution of demographic change based on current and alternative methods

4. Evaluating the assumption of a constant TTD spending distribution

5. Conclusions

Historical demographic data by age and TTD

Spending by Age-Sex, 1991-2013
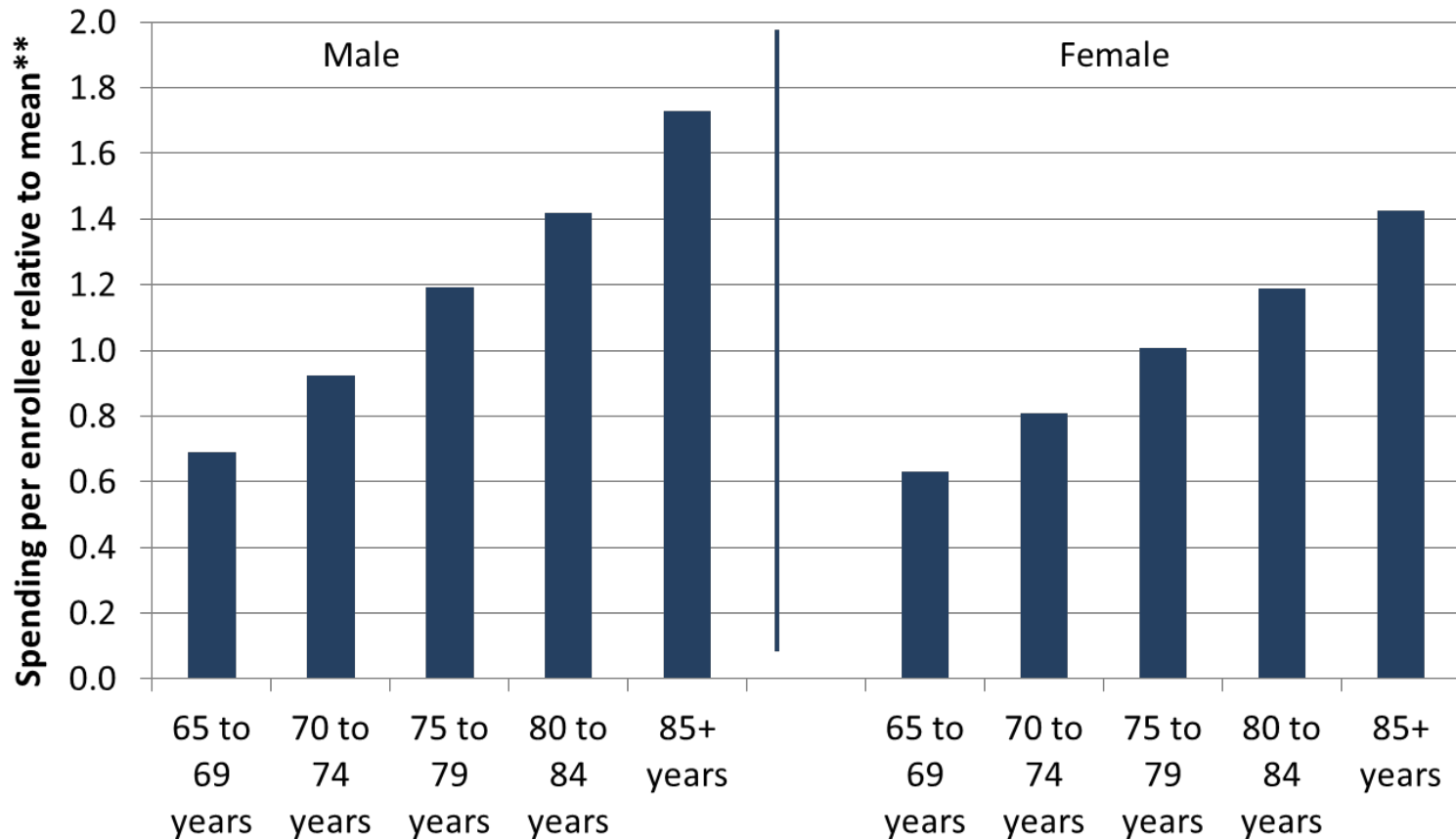
* Spending is per member per month (PMPM). Spending is in 2013 dollars, deflated by price indexes reflecting Medicare payment updates by services.

** Mean reflects average for all enrollees.

Demographic effects on spending are driven by changes in the composition of enrollment and spending

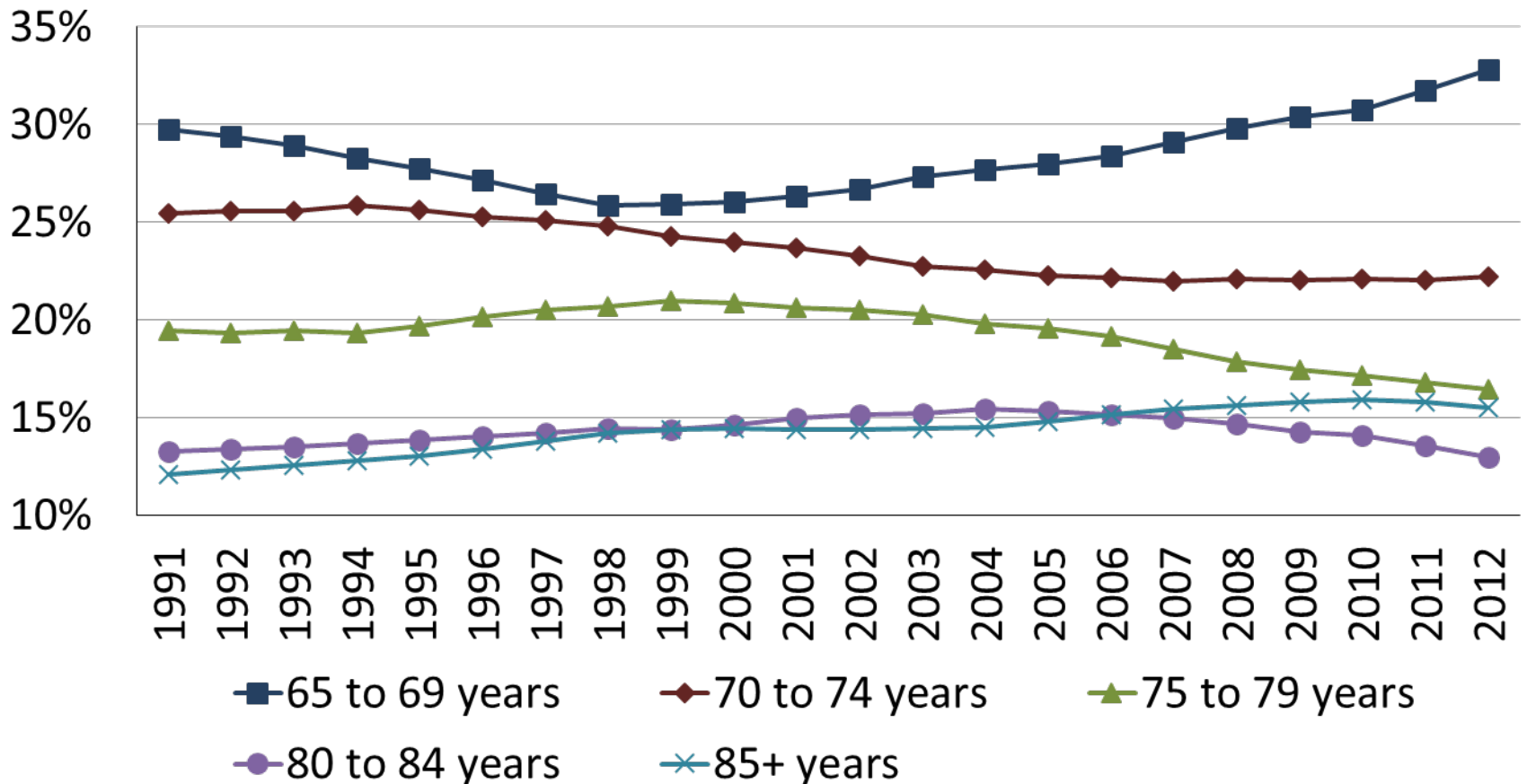Distribution of Medicare enrollment by age and sex

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Distribution of Medicare spending per enrollee by age and sex

- Either distribution of enrollment or the distribution of spending could potentially change over time
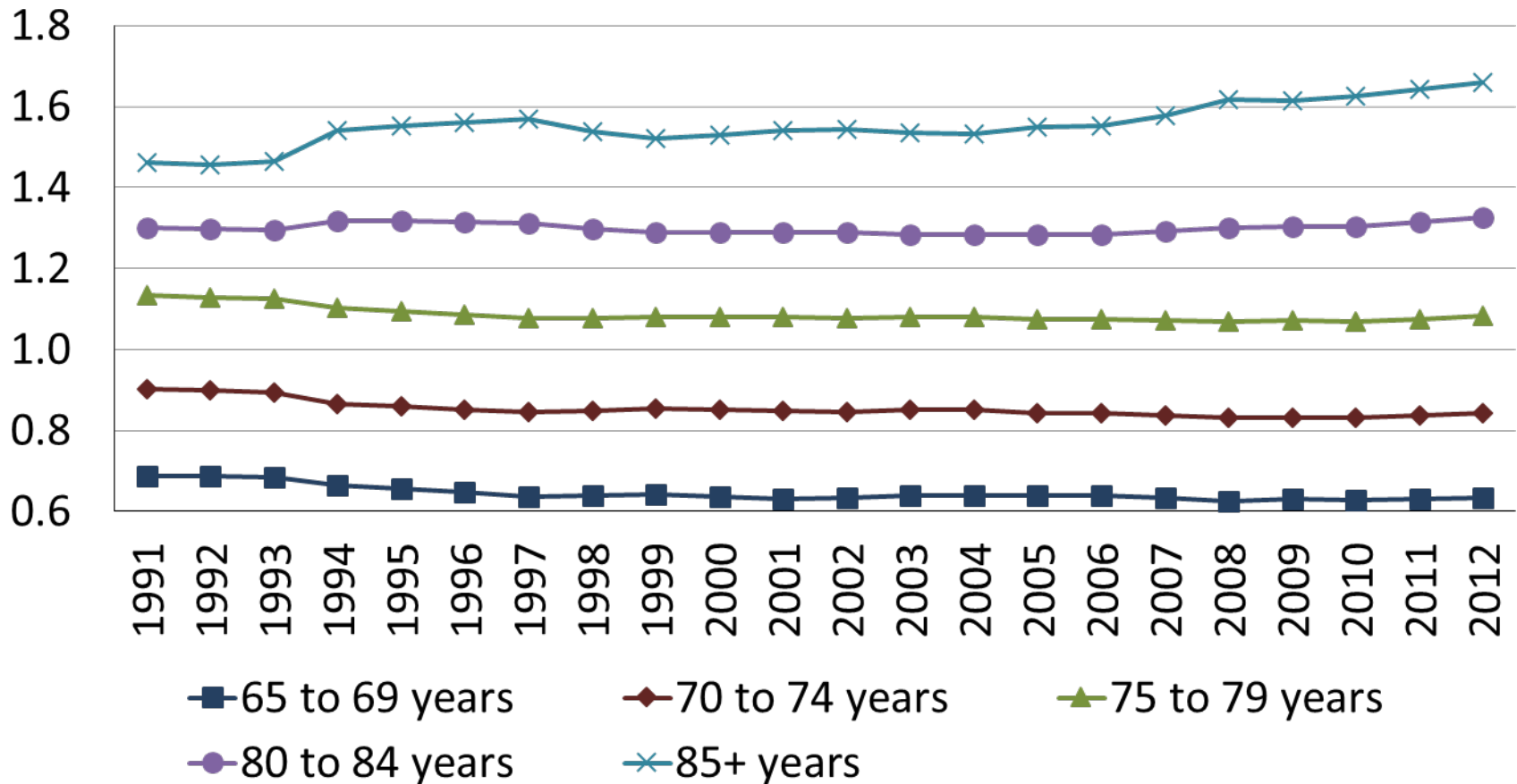
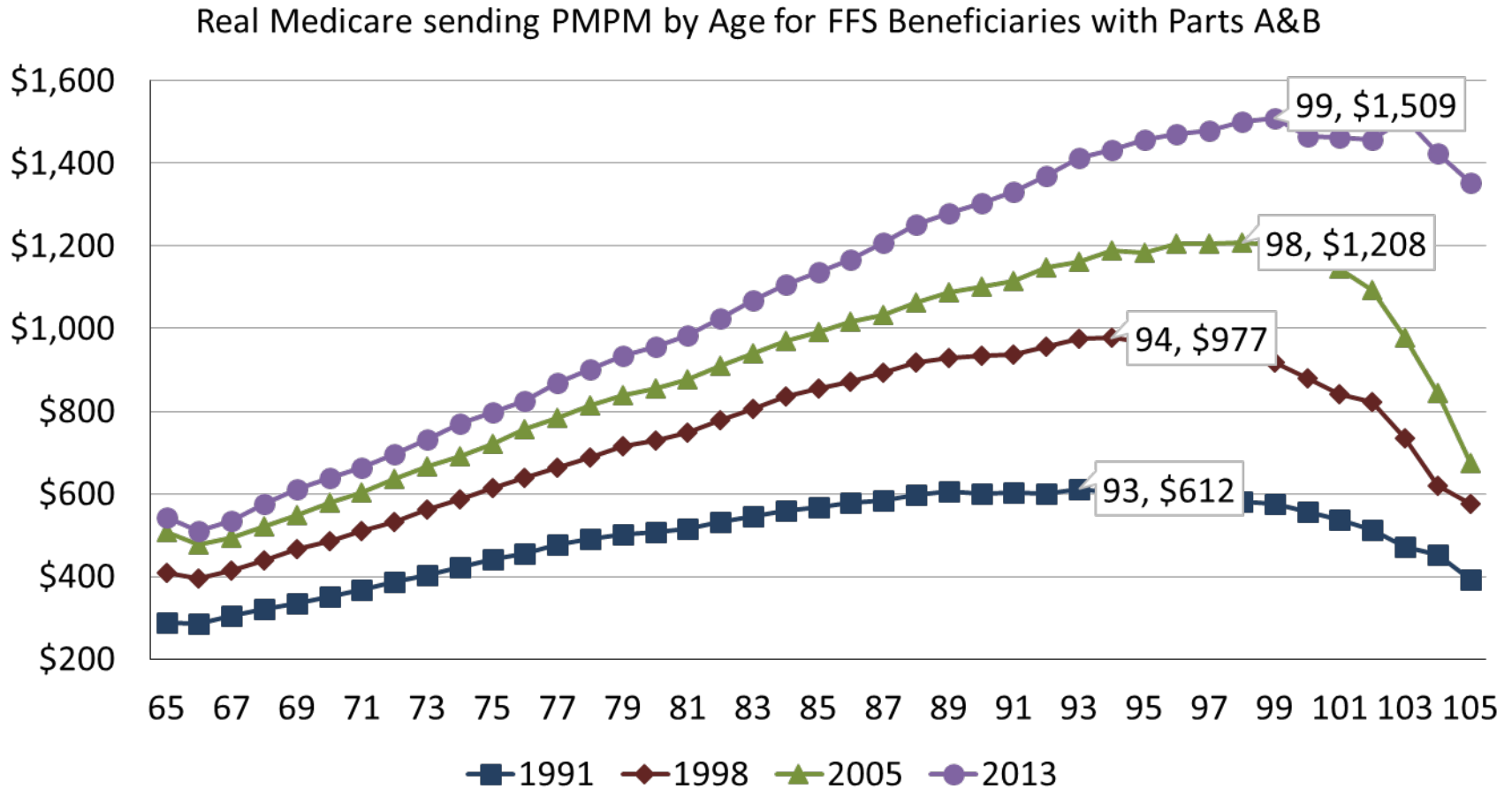# Change in distribution of Medicare FFS enrollment by age, 1991-2012

(percent of total)

Change in distribution of Medicare FFS spending by age, 1991-2012

(Ratio of spending by age cohort to mean)

Spending by Age Over Time

Real Medicare sending PMPM by Age for FFS Beneficiaries with Parts A&B

Source: 100% Medicare claims data, 1991-2013

Historical changes in age distribution

- Changes in the distribution of enrollment by age and sex are relatively larger than those for relative spending by age and sex

- Current projections methodology assumes that the distribution of spending by age and sex does not change over time

Variation in enrollment and spending by time-to-death (TTD)

- Medicare spending per enrollee varies not only by age and sex, but also by time-to-death.

- Spending for FFS enrollees in their last year of life averages 5.7 times the mean for 1991-2008.

- Variation by TTD explains a much larger fraction of cross-sectional variation in spending PMPM than either age or sex.

Real Medicare Spending PMPM by Age and Time-to-Death, 1991-2008

Age	Time to Death (years)					
	0	1	2	3	4	5+
65-69	$5,007	$1,921	$1,175	$918	$775	$288
70 to 74	$4,987	$1,863	$1,170	$934	$796	$356
75 to 79	$4,747	$1,745	$1,129	$925	$796	$422
80 to 84	$4,173	$1,558	$1,042	$870	$758	$461
85+	$3,156	$1,255	$893	$776	$694	$468

Distribution of enrollment by TTD: Ages 65-69 years

Shares of Medicare FFS enrollment by Time-to-death holding age-sex distribution constant						
(Percent of total, 1991-2008)						
	Time-to-death (years)					
	0	1	2	3	4	5+
1991	2.0%	2.2%	2.3%	2.4%	2.6%	88.5%
2000	1.8%	2.0%	2.1%	2.2%	2.2%	89.8%
2008	1.5%	1.6%	1.7%	1.8%	1.9%	91.4%

Distribution of enrollment by TTD: Ages 85+ years

Shares of Medicare FFS enrollment by Time-to-death holding age-sex distribution constant						
(Percent of total, 1991-2008)						
	Time-to-death (years)					
	0	1	2	3	4	5+
1991	13.6%	12.0%	11.4%	10.1%	9.1%	43.8%
2000	14.4%	13.0%	11.7%	10.3%	8.7%	42.0%
2008	13.4%	11.8%	10.9%	9.9%	8.8%	45.2%

Historical contribution of demographic change to growth in Medicare spending per enrollee

Methodology

- Current method of adjusting for the effects of demographic change on spending is based on the changing distribution of enrollment by age and sex

  – Relative spending by age-sex is assumed to stay constant.

- An alternative method of adjustment would add the changing distribution of enrollment by Time-to-death as a factor (in addition to age and sex).

Current Method of Demographic Adjustment by Age and Sex

Changing distribution of Medicare FFS enrollment by age and sex

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Fixed Medicare FFS spending per enrollee by age and sex

Demographic index – contribution of changing demographic composition to growth in Medicare spending per enrollee

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Inputs to Demographic Index

- Base-year distribution of Medicare spending per member per month for cohorts by age and sex **(Source: Medicare claims data)**

- Historical and projected time series for Medicare enrollment by age and sex cohorts **(Source: SSA Office of the Actuary)**

Demographic Index Under Current Projections Method

$$D_t = \sum_{g=1}^{2} \sum_{a=1}^{Na} (e_{g,a,t}/e_t) * h_{g,a}$$

D_t = index of spending for mix of enrollment across age and gender

$e_{g,a,t}$ = enrollment in gender g, age cohort a, in time period t

e_t = total enrollment across all cohorts in time period t

$h_{g,a}$ = base year spending PMPM for gender g, age cohort a

N_a = number of age cohorts (5: 65-69, 70-74, 75-79, 80-84, 85+)

Illustration: Impacts of Changing Age Mix

65-69 year old (77% of enrollment in 2008; 57% of enrollment in 2085)			
TTD	PMPM	2008	2085
0	$5,007	1.5%	1.5%
1	$1,921	1.6%	1.6%
2	$1,175	1.7%	1.7%
3	$918	1.8%	1.8%
4	$775	1.9%	1.9%
5+	$288	91.4%	91.4%
	Average=	$421	$421

85+ year old (23% of enrollment in 2008; 43% of enrollment in year 2085)			
TTD	PMPM	2008	2085
0	$3,156	13.4%	13.4%
1	$1,255	11.8%	11.8%
2	$893	10.9%	10.9%
3	$776	9.9%	9.9%
4	$694	8.8%	8.8%
5+	$468	45.2%	45.2%
	Average=	$1,017	$1,017

	Average Spending due to Demographics	
	Age-Sex	
2008	$558 ($421*0.77+$1,017*0.23)	
2085	$677 ($421*0.57+$1,017*0.43)	
2008-2085	21%	
Ann. Avg.	0.3%	

Source: Medicare claims data and TR 2014.

Assumptions and Implications of the Age-Sex Adjustment

- Assumes future 85+ as expensive as today's 85+, holding everything else constant.

- Total spending is driven by the age-sex enrollment distribution of future beneficiaries only.

- As mortality rates fall and people live longer, there are more expensive elderly, and hence higher spending.

Proportion of 85+ in FFS Part A (SSA TR2012)
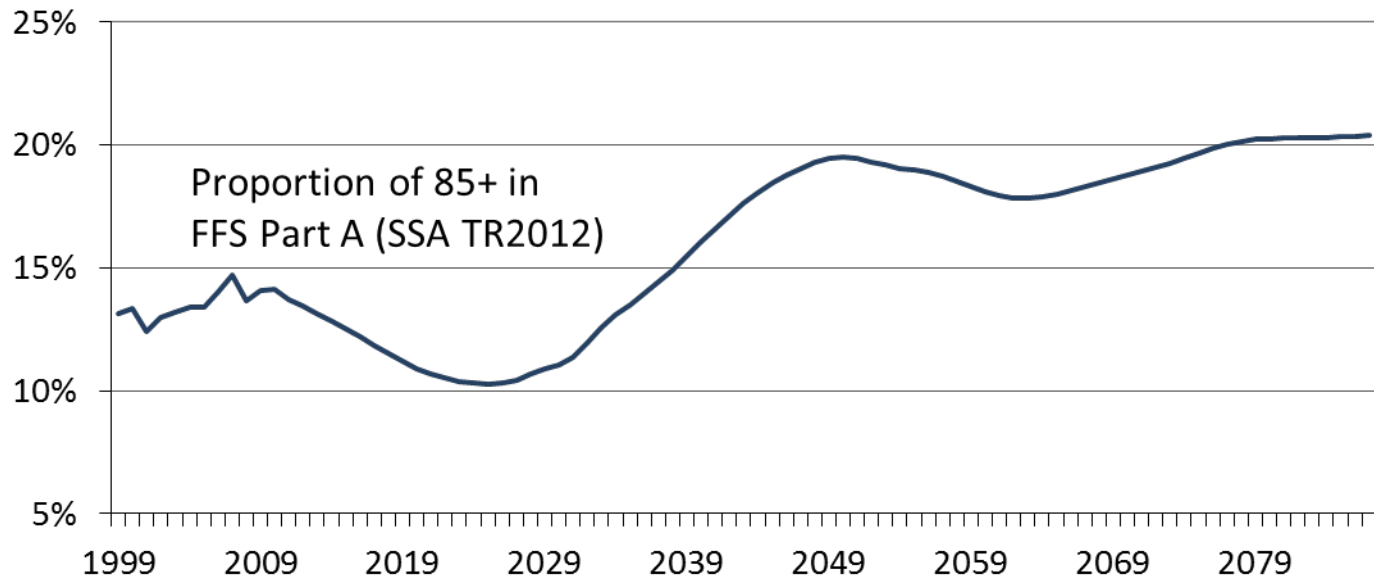
Alternative Method: Control for Variation by Age, Sex and TTD

- Strong relationship between spending PMPM and TTD.

- Distribution by TTD shifts over time as a function of mortality rates.

- As a result, enrollees are on average farther from death and need less care.

- Controlling for changing distribution of enrollment by TTD captures this dynamic and reduces the contribution of demographics to spending growth.

Inputs to Age-Sex-TTD Demographic Index

- Base-year distribution of Medicare spending per member per month for cohorts by age and sex **(Source: FFS Medicare claims data, 2008)**

- Historical and projected time series for Medicare enrollment by age and sex cohorts **(Source: SSA Office of the Actuary)**

- Time of death for enrollees over the subsequent five years **(Source: FFS Medicare claims data through 2013, so 2008 is the last year with complete spending profile by TTD)**

- Projected survival probabilities by age-sex **(Source: SSA Office of the Actuary)**

Age-Sex-TTD Based Demographic Index

$$D'_t = \sum_{g=1}^{2} \sum_{a=1}^{Na} \sum_{d=1}^{Nd} \left(e_{g,a,d,t}/e_t\right) * h_{g,a,d}$$

D'_t = Index of spending for mix of enrollment across age, sex, and TTD

$e_{g,a,d,t}$ = enrollment in gender g, age cohort a, TTD group d, in time period t

e_t = total enrollment across all cohorts in time period t

$h_{g,a,d}$ = base year spending PMPM for gender g, age cohort a, TTD group d

N_a = number of age cohorts

N_d = number of TTD cohorts (6: 0,1,2,3,4,5+)

SSA TR2012 Projection - Survival Probabilities for 65-yr old
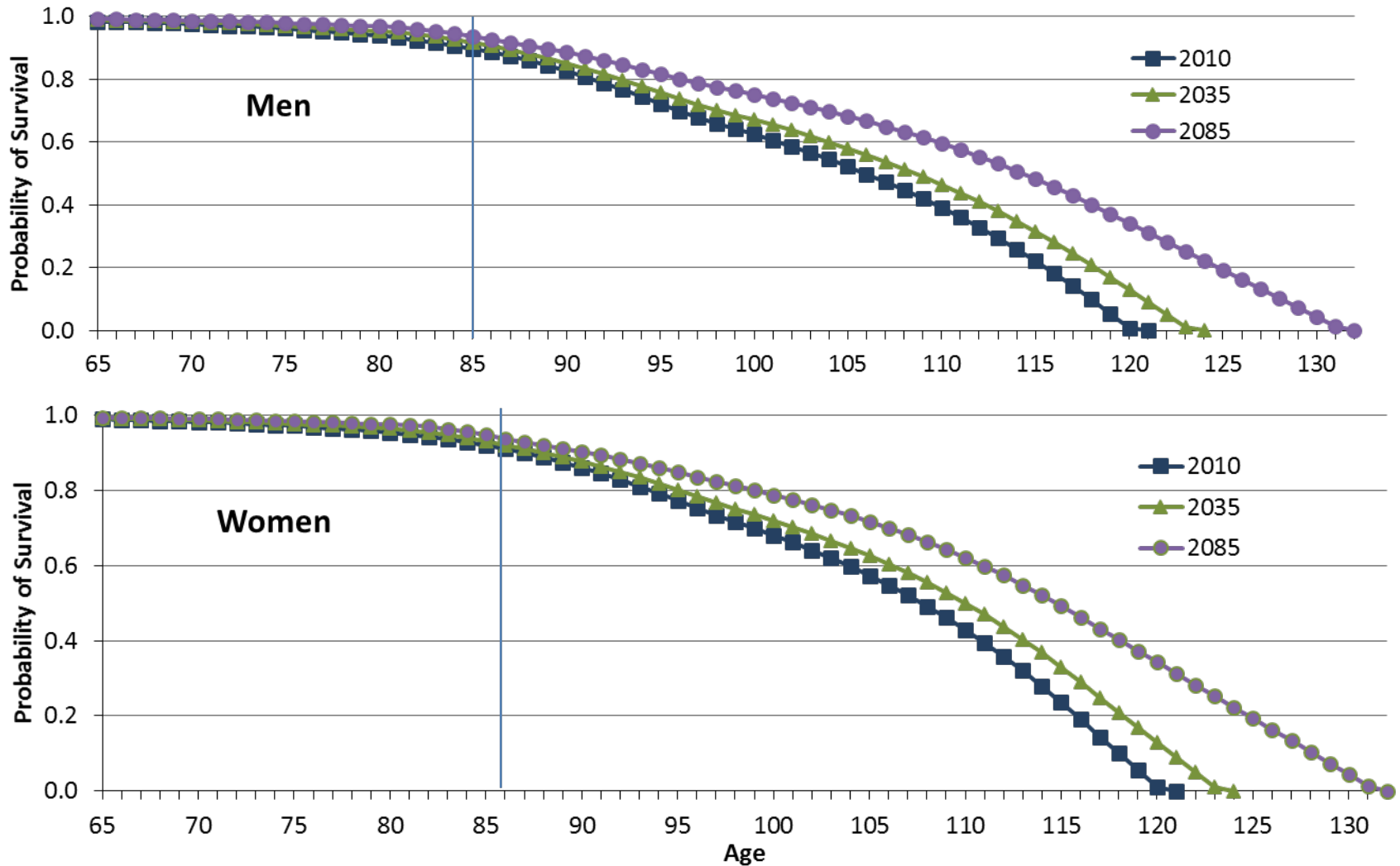
Source: SSA TR2012 intermediate projections

SSA TR2012 Projection – TTD Dist. for 65-yr Old
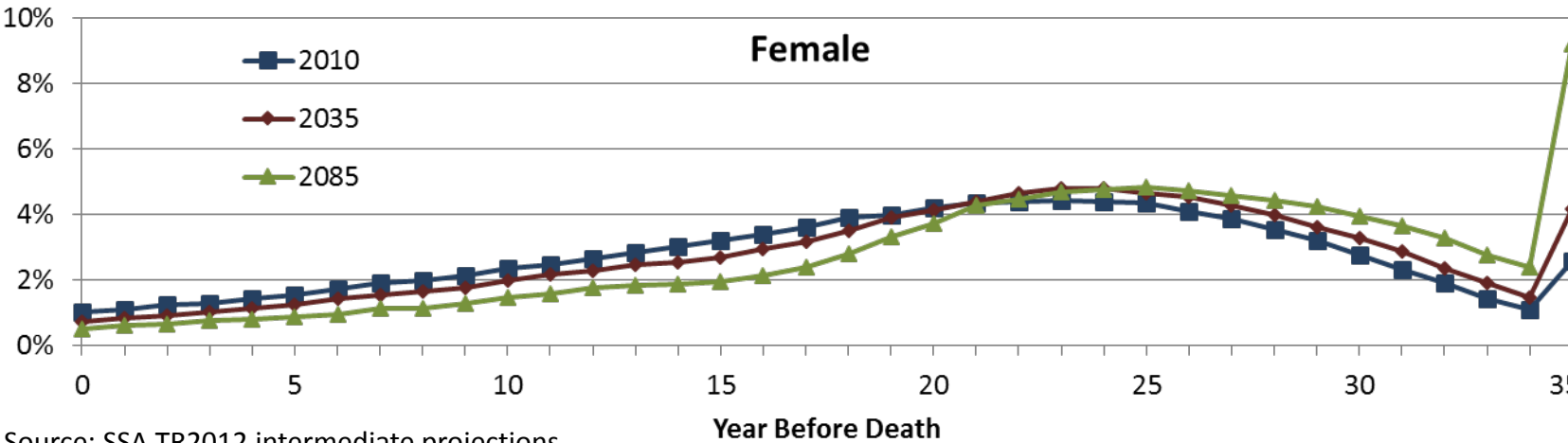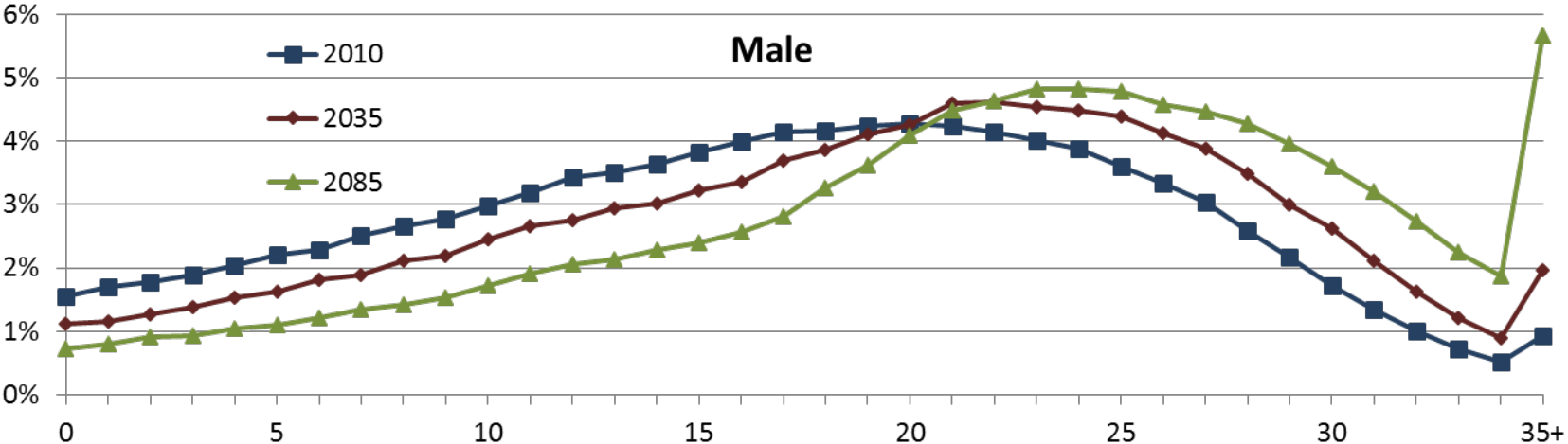
Source: SSA TR2012 intermediate projections.

Illustration: Impacts of Changing <u>Age</u> and <u>TTD</u>

65-69 year old (77% of enrollment in 2008; 57% of enrollment in 2085)			
TTD	PMPM	2008	2085
0	$5,007	1.5%	0.8%
1	$1,921	1.6%	0.9%
2	$1,175	1.7%	0.9%
3	$918	1.8%	1.0%
4	$775	1.9%	1.1%
5+	$288	91.4%	95.3%
	Average=	$421	$360

85+ year old (23% of enrollment in 2008; 43% of enrollment in year 2085)			
TTD	PMPM	2008	2085
0	$3,156	13.4%	11.1%
1	$1,255	11.8%	10.6%
2	$893	10.9%	10.0%
3	$776	9.9%	9.3%
4	$694	8.8%	8.6%
5+	$468	45.2%	50.3%
	Average=	$1,017	$939

	Average Spending due to Demographics	
	Age-Sex	Age-Sex-TTD
2008	$558 ($421*0.77+$1,017*0.23)	$558 ($421*0.77+$1,017*0.23)
2085	$677 ($421*0.57+$1,017*0.43)	$609 ($360*0.57+$939*0.43)
2008-2085	21%	9.1%
Ann. Avg.	0.3%	0.1%

Source: Medicare claims data and TR 2014.

Contribution of Demographics to Medicare Spending Growth

- This figure shows annual contribution to real spending growth due to changes in demographics.

- Blue line is the estimate using current method adjusting for changes in age-sex; red line adjusts for changes by TTD in addition to age-sex.

Avg. 1992-2008:
Age-Sex = 0.16%
Age-Sex-TTD = -0.30%
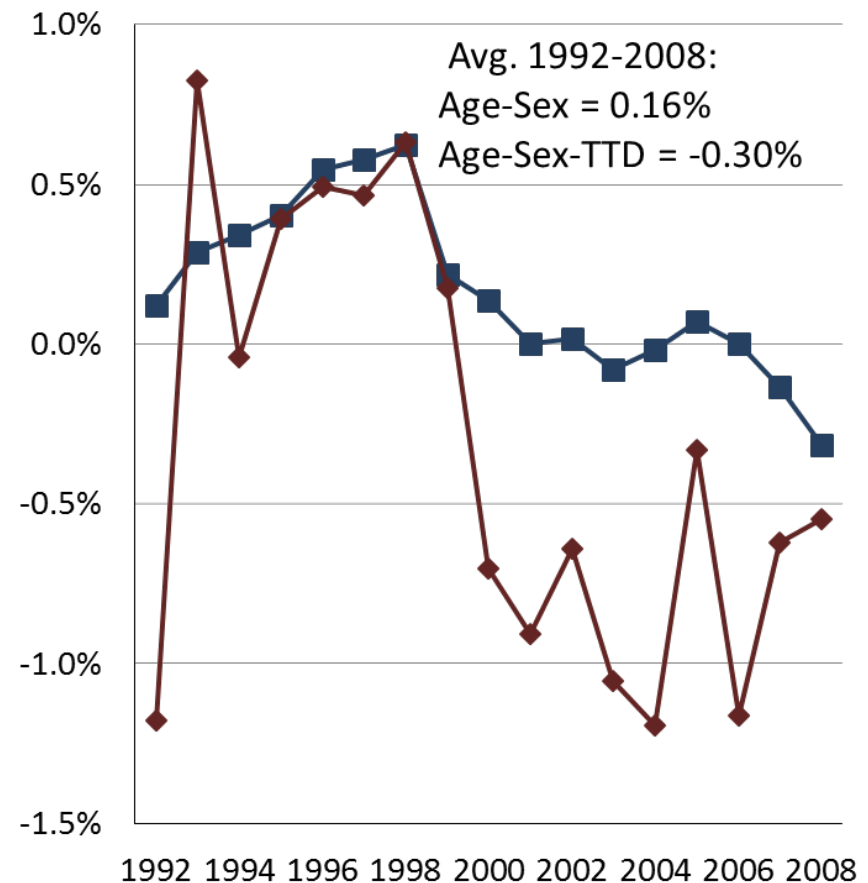
Differential* Between Methods and Growth in 65+ Mortality Rate

- Differential = Age-Sex-TTD impact less Age-Sex impact

- The difference tracks mortality over time, because changes in the TTD distribution are a function of changes in mortality rates.
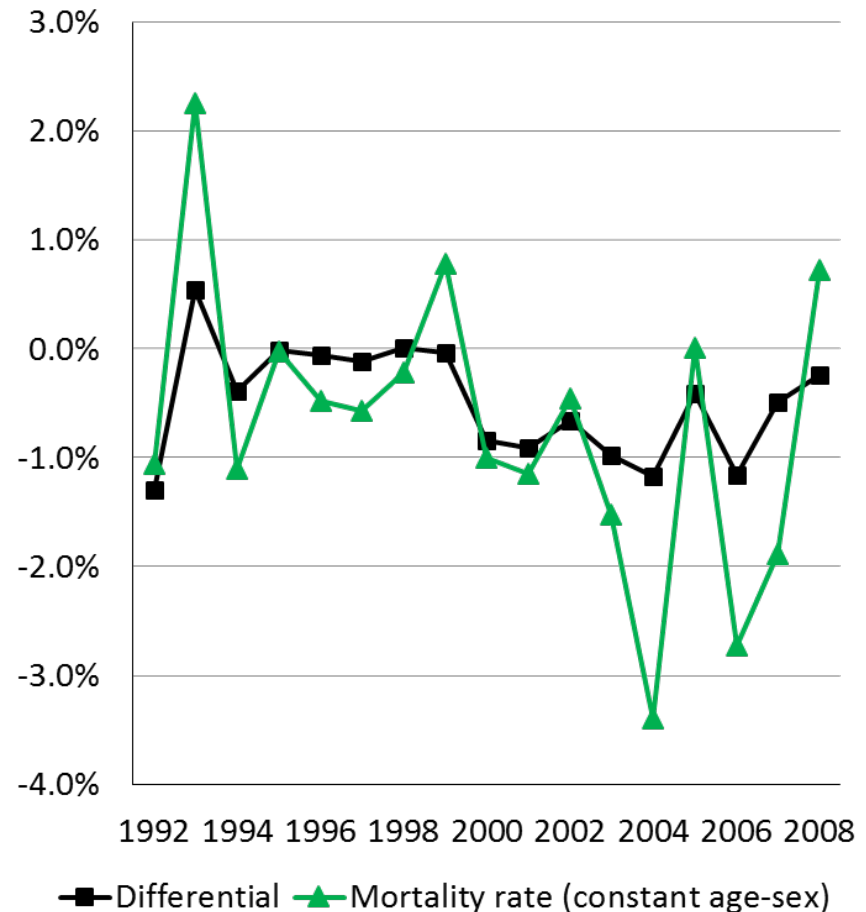
Demographic contribution is small in relative terms

Growth in real Medicare FFS spending PMPM with Age-Sex and Age-Sex-TTD based contributions to growth, 1992-2008
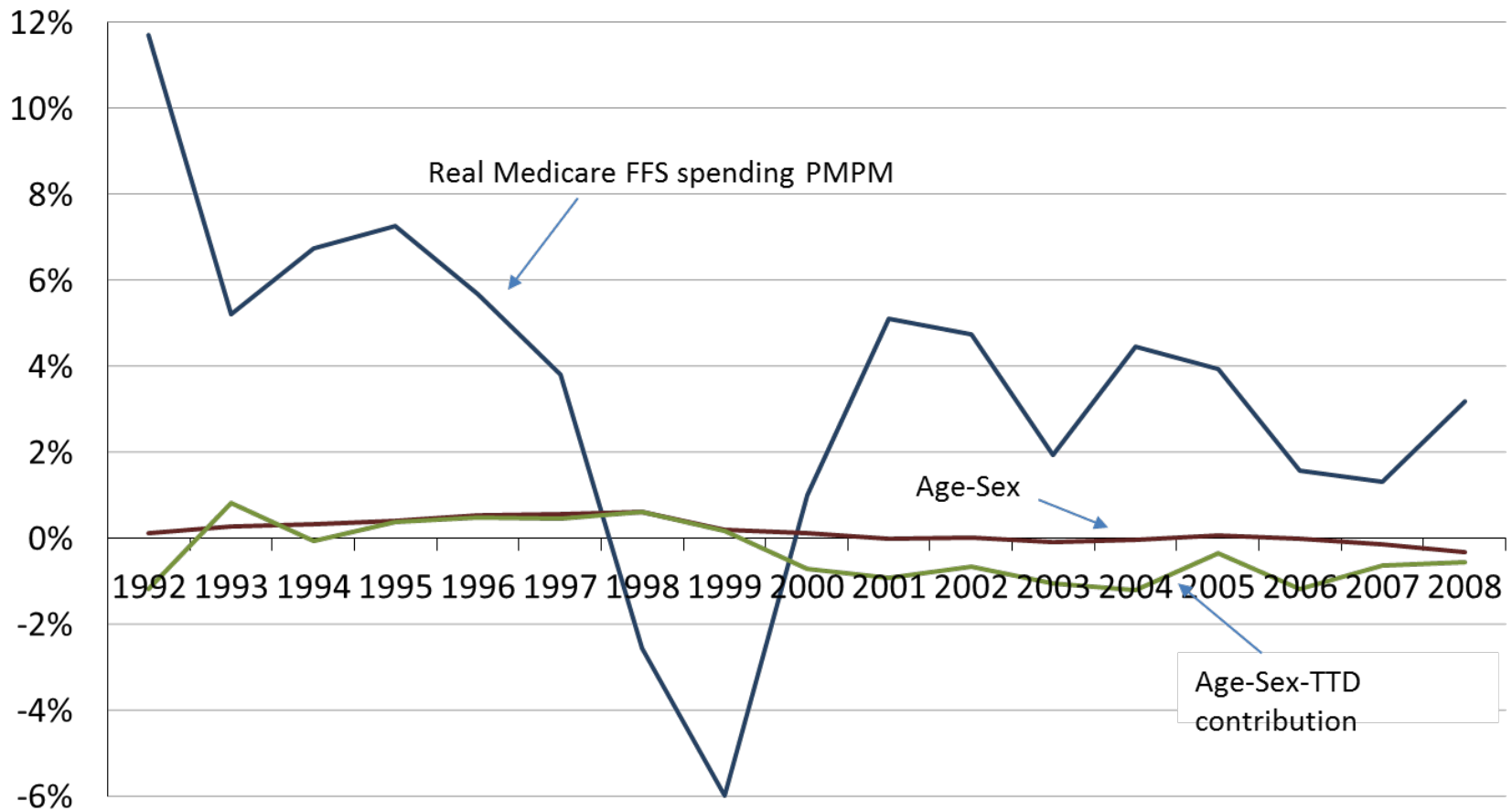
Projecting the contribution of demographic change based on Age-Sex and Age-Sex-TTD methods
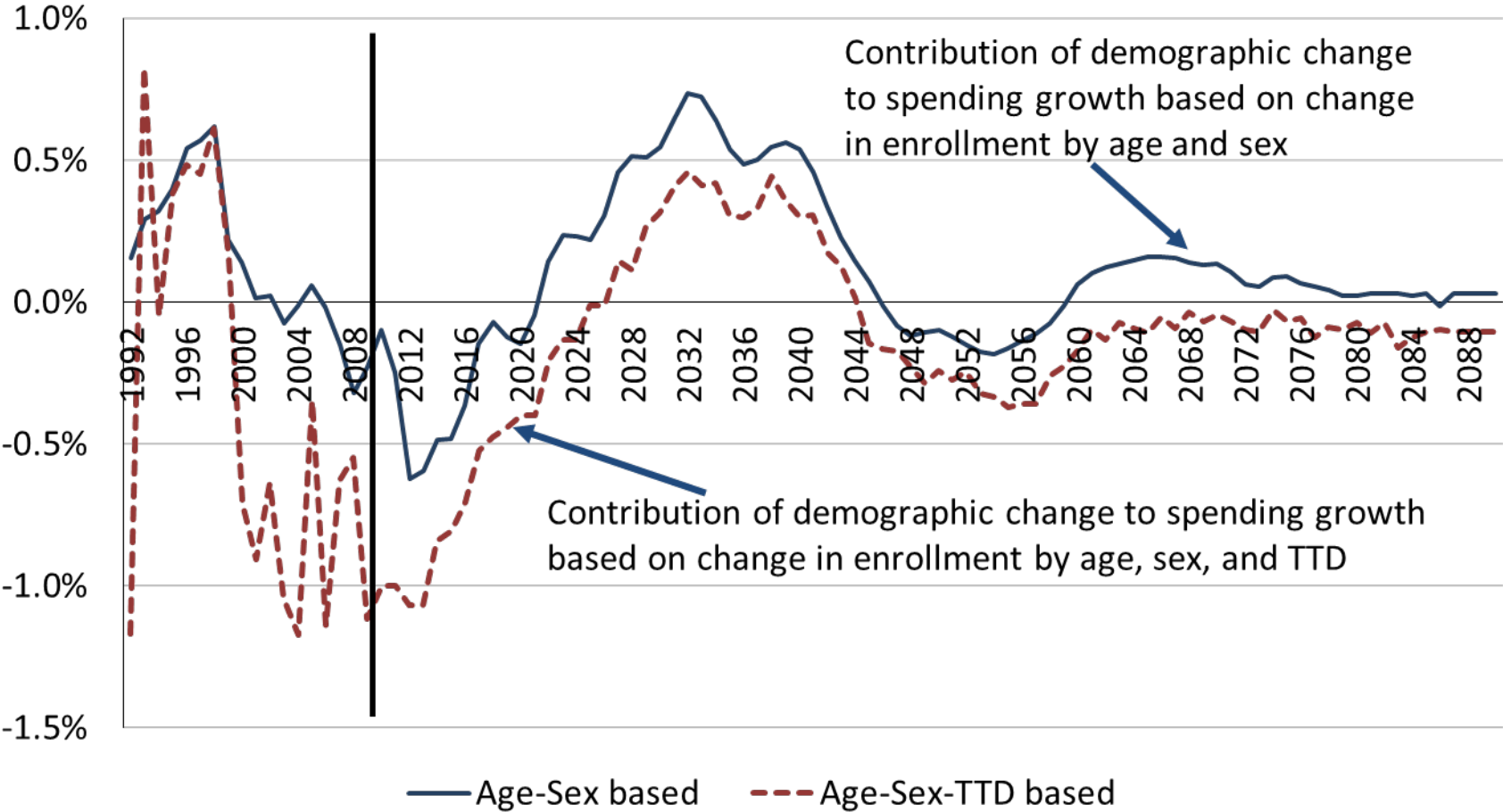
Simulation of enrollment distribution by TTD over projection

- SSA generates period life tables: Probabilities of death for each age-sex cohort in each year.

- Simulate the distribution of Medicare beneficiaries by TTD for each age-sex-year combination based on repeated random draws from a probability distribution parameterized using SSA inputs.

- 250,000 observations for each age-sex-year combination are generated to produce a simulated distribution of Medicare enrollment by TTD out to 2090.

Simulation: Impact of controlling for change in enrollment distribution by TTD
## (assuming spending by TTD constant in the future)

(percent change)

Contribution of demographic change to spending growth based on change in enrollment by age and sex

Contribution of demographic change to spending growth based on change in enrollment by age, sex, and TTD

—— Age-Sex based   - - - Age-Sex-TTD based

Evaluating the assumption of a constant TTD spending distribution

Distribution of spending by Age-sex-TTD tends to be stable over time

Ratio of Real Spending PMPM for TTD=0 to TTD=5+ years by age group
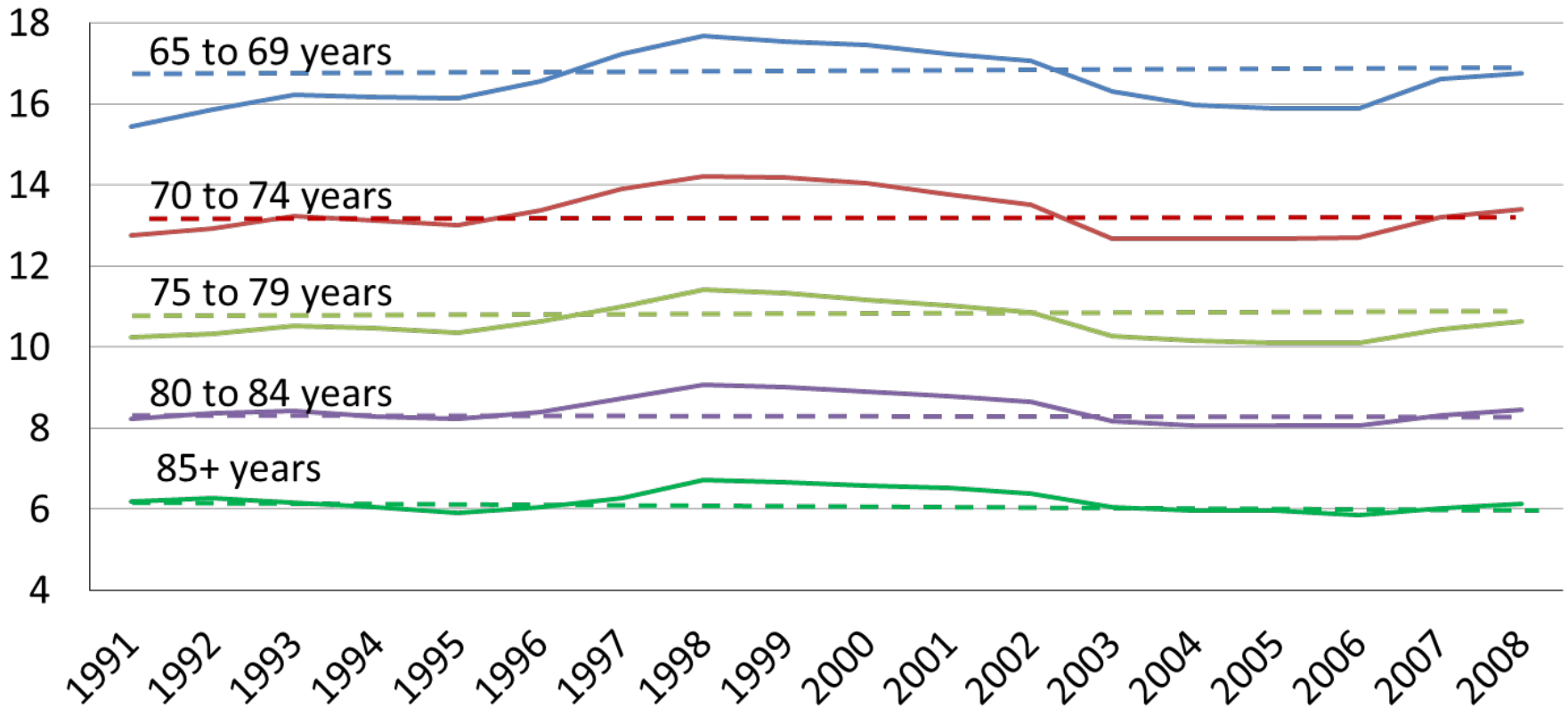
*Includes Inpatient, Outpatient, Physician and Other professional, home health, SNF, and Hospice

Spending distribution changes at the sectoral level, but not on a net basis

- There are marked and consistent trends in spending per enrollee by TTD for services provided in inpatient settings, SNF, home health, and hospice.

- These trends reflect the shift of care out of inpatient settings, and response to legislation (e.g. BBA 1997)

- These shifts tend to be offsetting in direction and magnitude: there is little trend at the aggregate level.

Conclusions and Discussion

Conclusions

- TTD explains more of the historical cross-sectional variation in Medicare spending than age.

- Improving mortality and the impact on TTD suggests a negative demographic contribution to Medicare spending growth (rather than a small positive when accounting for changes in age-sex only).

- The overall effect on Medicare spending growth of accounting for TTD is small on an annual basis, but this effect accumulates over 75 years and the impacts vary by type of service.

Discussion

- Is this effort worth pursuing?

- Some OACT implementation questions?
  - Is it reasonable to use simulations to project future TTD improvement?
  - Is it reasonable to assume the spending distribution by TTD remains constant over time? If not, how should we project it?
  - We didn't summarize the service-level impacts in this presentation, but there are differential impacts, largely reflecting statutory or policy related effects. Should TTD be modeled by service or in aggregate?
  - The lower contribution of TTD implies higher residual spending growth, how should we interpret that?
  - Is improvement by TTD related to other demand/supply behavior that should be incorporated into the models?

- What other questions/considerations?