Table 10a: Retirement Probits-Males Sample

	Accrual model		Peak value model		Option value model	
	Linear age	Age dummies	Linear age	Age dummies	Linear age	Age dummies
SSW	**0.001**	**-0.006**	**-0.002**	**-0.005**	**0.008**	**-0.007**
	(0.006)	**(0.006)**	**(0.006)**	**(0.006)**	**(0.006)**	**(0.006)**
$10000 change	**0.02**	**-0.10**	**-0.03**	**-0.09**	**0.15**	**-0.11**
Incentive measure	**-0.399**	**-0.228**	**-0.367**	**-0.204**	**-0.035**	**0.019**
	(0.048)	**(0.109)**	**(0.039)**	**(0.081)**	**(0.015)**	**(0.017)**
$1000 change	**-0.68**	**-0.37**	**-0.62**	**-0.33**	**-0.06**	**0.03**
Property income	0.102	0.103	0.101	0.103	0.097	0.102
	(0.050)	(0.049)	(0.048)	(0.049)	(0.050)	(0.049)
Health condition: not well	0.265	0.292	0.265	0.290	0.255	0.283
	(0.089)	(0.093)	(0.090)	(0.093)	(0.088)	(0.093)
Health condition: bad or sick	0.929	1.011	0.958	1.012	0.886	1.015
	(0.157)	(0.155)	(0.160)	(0.156)	(0.153)	(0.154)
Projected earnings	0.054	-1.447	0.282	-1.479	-2.533	-1.365
	(0.945)	(1.091)	(0.998)	(1.091)	(0.854)	(1.106)
Average lifetime earnings	0.477	1.817	0.343	1.851	2.591	1.756
	(0.783)	(0.929)	(0.837)	(0.931)	(0.718)	(0.939)
Square of PE	0.059	0.297	0.130	0.318	0.205	0.252
	(0.128)	(0.139)	(0.141)	(0.140)	(0.118)	(0.140)
Square of ALE	-0.187	-0.368	-0.246	-0.384	-0.277	-0.336
	(0.093)	(0.110)	(0.105)	(0.112)	(0.089)	(0.111)
Age	-0.032		-0.045		-0.084	
	(0.020)		(0.020)		(0.020)	
Age55		0.912		0.790		0.858
		(0.445)		(0.446)		(0.445)
Age56		0.703		0.483		0.761
		(0.445)		(0.452)		(0.453)
Age57		0.383		0.020		0.399
		(0.473)		(0.499)		(0.491)
Age58		1.047		0.541		1.038
		(0.466)		(0.494)		(0.498)
Age59		1.421		0.979		1.957
		(0.513)		(0.578)		(0.498)
Age60		1.527		1.086		2.002
		(0.522)		(0.583)		(0.516)
Age61		0.604		0.169		1.099
		(0.549)		(0.606)		(0.541)
Age62		0.914		0.479		1.405
		(0.554)		(0.611)		(0.545)
Age63		0.539		0.120		1.143
		(0.588)		(0.643)		(0.561)
Age64		1.272		0.816		1.522
		(0.504)		(0.550)		(0.523)
Age65		0.864		0.402		1.147
		(0.520)		(0.564)		(0.544)
Age66		0.689		0.235		0.969
		(0.559)		(0.604)		(0.588)
Age67		0.302		-0.159		0.587
		(0.605)		(0.646)		(0.633)
Age68		0.479		0.017		0.772
		(0.639)		(0.678)		(0.676)
Pseudo R^2	0.172	0.225	0.185	0.226	0.137	0.223
Other controls	YES	YES	YES	YES	YES	YES

Notes: Other control variables are 9 occupational dummies, dummies for 4 categories of establishment size, and 8 regional dummies. The estimated parameters on these variables are not reported.
Figures in parentheses show robust standard errors.

Table 10b: Retirement Probits-Females Sample

	Accrual model		Peak value model		Option value model	
	Linear age	Age dummies	Linear age	Age dummies	Linear age	Age dummies
SSW	**0.007**	**0.010**	**0.006**	**0.011**	**0.012**	**0.001**
	(0.004)	**(0.004)**	**(0.004)**	**(0.004)**	**(0.005)**	**(0.006)**
$10000 change	**0.14**	**0.21**	**0.14**	**0.00**	**0.26**	**0.03**
Incentive measure	**-0.150**	**0.024**	**-0.101**	**0.040**	**-0.008**	**0.041**
	(0.058)	**(0.069)**	**(0.039)**	**(0.046)**	**(0.019)**	**(0.019)**
$1000 change	**-0.32**	**0.05**	**-0.08**	**-0.14**	**-0.02**	**0.08**
Property income	0.804	0.783	0.807	0.781	0.805	0.779
	(0.155)	(0.149)	(0.156)	(0.149)	(0.155)	(0.148)
Health condition: not well	0.124	0.144	0.127	0.143	0.122	0.148
	(0.115)	(0.120)	(0.115)	(0.120)	(0.114)	(0.121)
Health condition: bad or sick	1.025	1.088	1.015	1.090	0.999	1.101
	(0.219)	(0.227)	(0.220)	(0.226)	(0.220)	(0.226)
Projected earnings	-0.141	0.680	-0.310	0.763	-0.660	0.752
	(1.797)	(2.033)	(1.812)	(2.022)	(1.753)	(2.039)
Average lifetime earnings	1.842	1.087	1.976	1.024	2.340	0.965
	(1.518)	(1.754)	(1.530)	(1.745)	(1.490)	(1.762)
Square of PE	-0.522	-0.681	-0.468	-0.712	-0.442	-0.769
	(0.524)	(0.555)	(0.531)	(0.548)	(0.514)	(0.555)
Square of ALE	-0.402	-0.260	-0.437	-0.241	-0.482	-0.195
	(0.393)	(0.424)	(0.398)	(0.420)	(0.387)	(0.426)
Age	0.015		0.007		0.018	
	(0.016)		(0.017)		(0.021)	
Age55		0.251		0.276		0.318
		(0.217)		(0.219)		(0.221)
Age56		0.511		0.548		0.641
		(0.216)		(0.225)		(0.230)
Age57		0.724		0.778		0.896
		(0.208)		(0.222)		(0.234)
Age58		0.524		0.594		0.744
		(0.215)		(0.232)		(0.248)
Age59		1.218		1.307		1.466
		(0.225)		(0.252)		(0.260)
Age60		1.092		1.178		1.336
		(0.234)		(0.260)		(0.266)
Age61		0.977		1.065		1.238
		(0.259)		(0.283)		(0.289)
Age62		0.359		0.445		0.627
		(0.314)		(0.331)		(0.343)
Age63		0.416		0.502		0.701
		(0.298)		(0.319)		(0.327)
Age64		0.768		0.840		1.089
		(0.300)		(0.316)		(0.350)
Age65		0.365		0.435		0.747
		(0.383)		(0.395)		(0.430)
Age66		0.305		0.382		0.686
		(0.419)		(0.431)		(0.461)
Age67		0.065		0.142		0.469
		(0.551)		(0.559)		(0.585)
Age68		0.761		0.836		1.160
		(0.485)		(0.496)		(0.528)
Pseudo R^2	0.161	0.200	0.161	0.201	0.155	0.204
Other controls	YES	YES	YES	YES	YES	YES

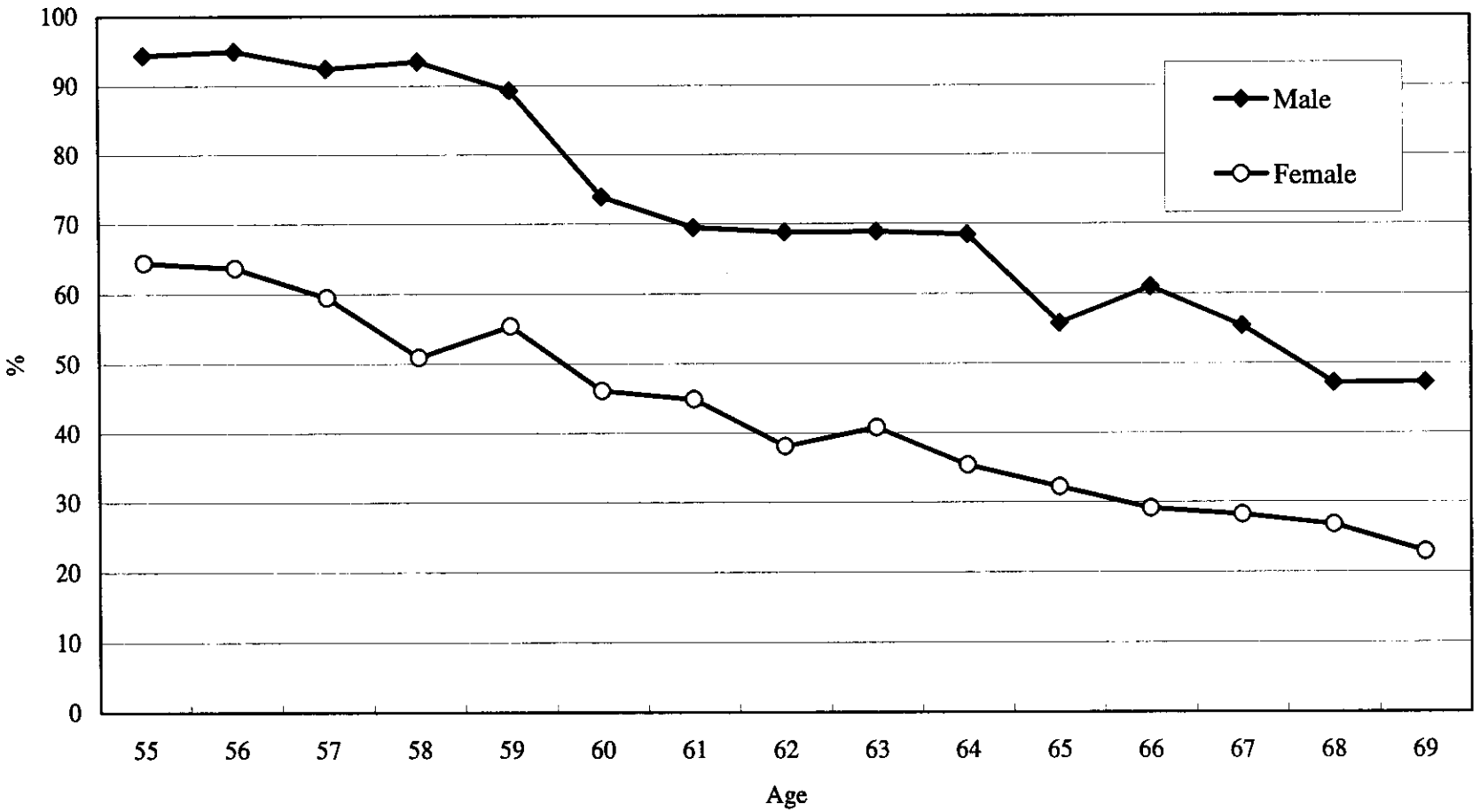
Notes: Other control variables are 9 occupational dummies, dummies for 4 categories of establishment size, and 8 regional dummies. The estimated parameters on these variables are not reported.
Figures in parentheses show robust standard errors.

Table 11: Average Retirement Ages in Simulations

	Plus Three Years	Common Reform
Males		
Actual	**60.8**	**60.8**
Accrual-S1	61.0	60.5
Accrual-S2	61.0	60.9
Accrual-S3	63.0	60.4
average	**61.7**	**60.6**
Peak Value-S1	62.1	59.8
Peak Value-S2	61.4	60.4
Peak Value-S3	62.8	60.0
average	**62.1**	**60.1**
Option Value-S1	61.0	60.7
Option Value-S2	60.7	60.8
Option Value-S3	63.2	60.5
average	**61.6**	**60.7**
S1-average	61.4	60.3
S2-average	61.0	60.7
S3-average	63.0	60.3
average	**61.8**	**60.4**
Females		
Actual	**59.3**	**59.3**
Peak Value-S1	59.9	59.2
Peak Value-S2	59.3	59.4
Peak Value-S3	60.8	59.6
average	**60.0**	**59.4**

Note: The average retirement age is the actual retimerent age plus the estimated change from the baseline in each case.

Figure1: Labor Force Participation Ratio of the Japanese Elderly, 1996



Source: Ministry of Labor, Survey of Labor Market Participation of Older Persons,

Figure2a: The Retirement Hazard and Age Dummies for Males

Figure 2b: The Retirement Hazard and Age Dummies for Females

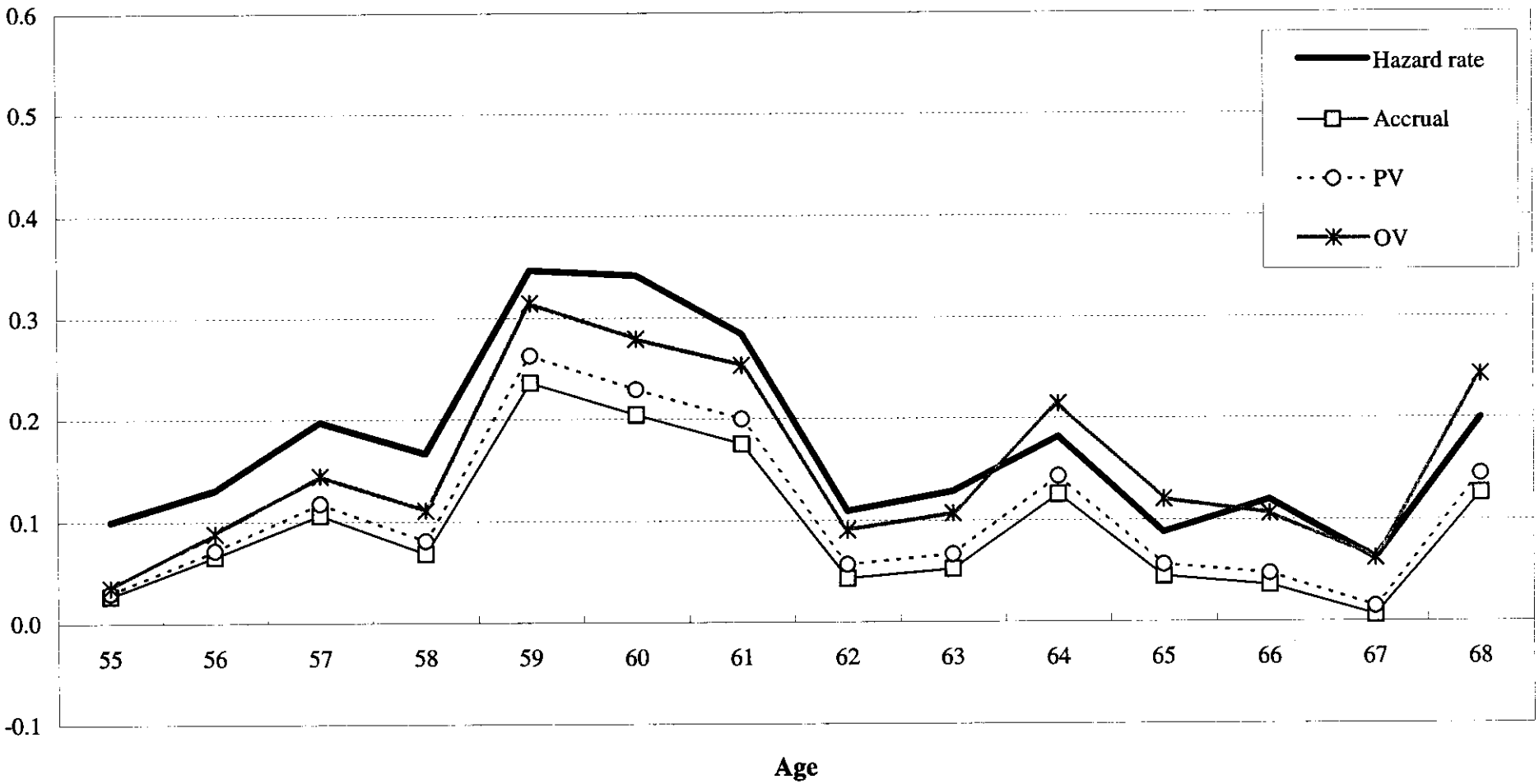


Figure 3a: Simulation S1 on Males using Accrual Estimates

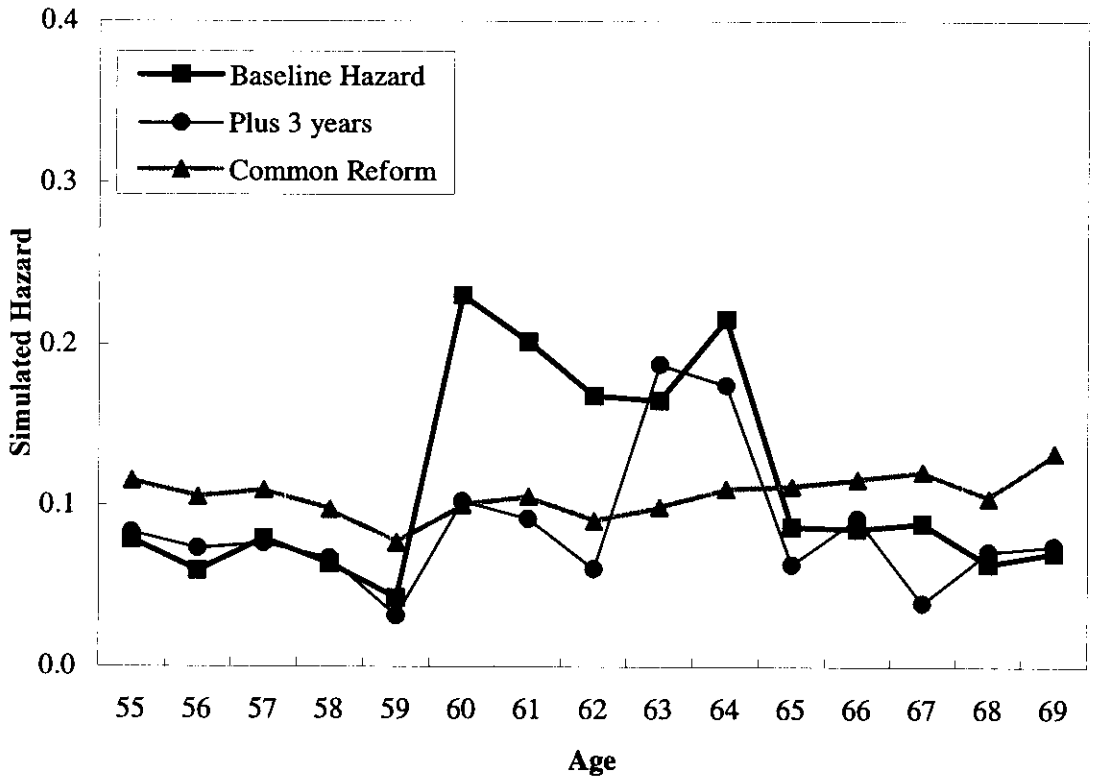


Figure 3b: Simulation S1 on Males using Accrual Estimates

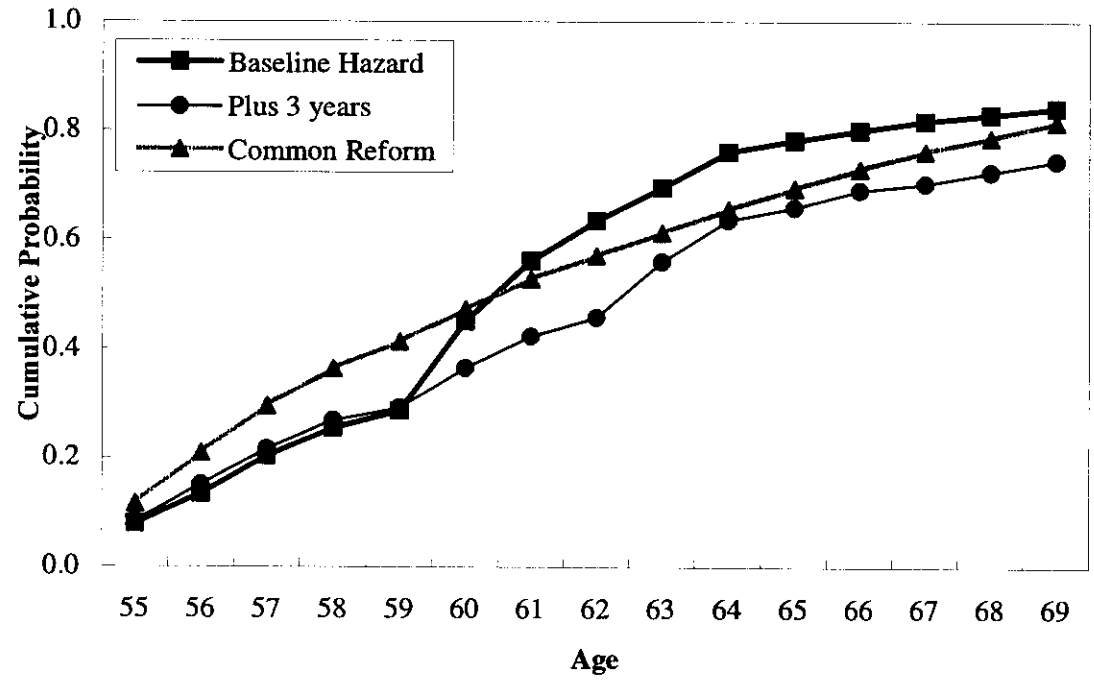


Figure 4a: Simulation S2 on Males using Accrual Estimates

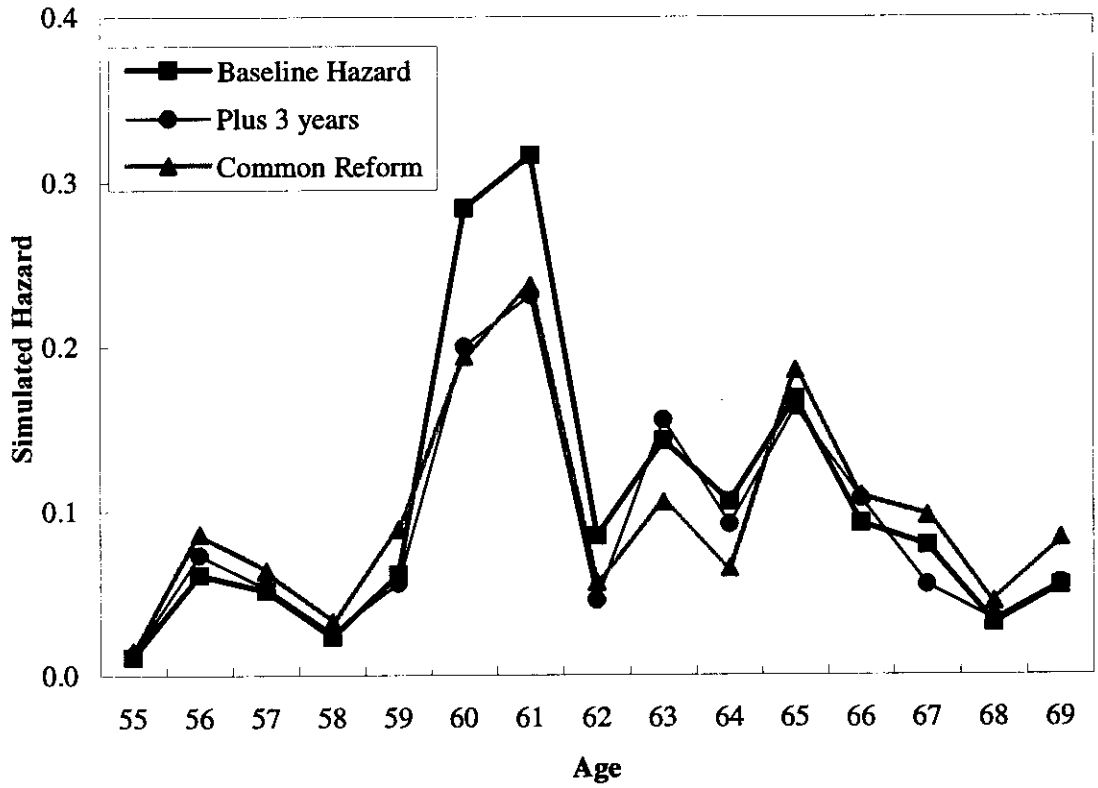


Figure 4b: Simulation S2 on Males using Accrual Estimates

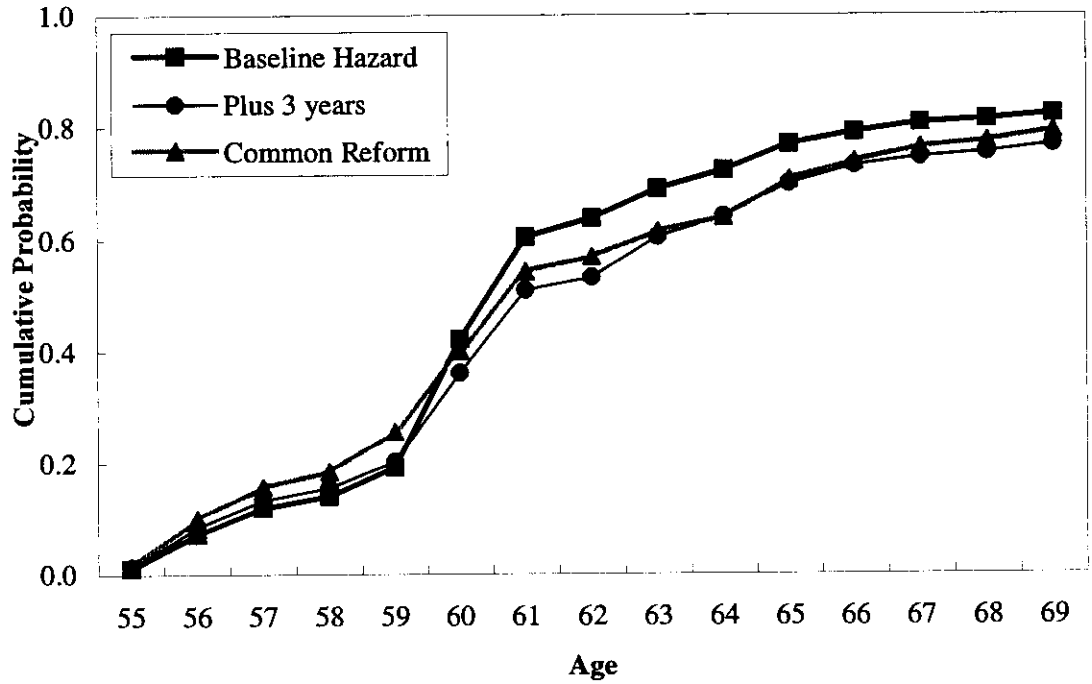


Figure 5a: Simulation S3 on Males using Accrual Estimates

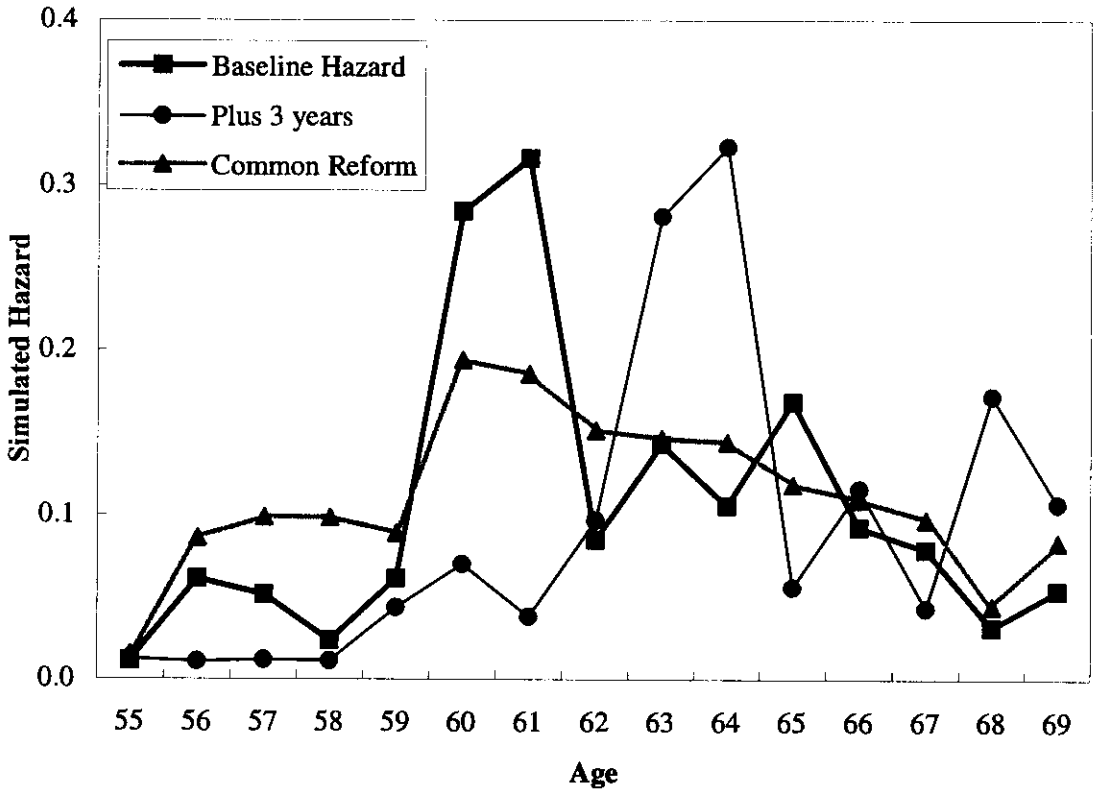


Figure 5b: Simulation S3 on Males using Accrual Estimates

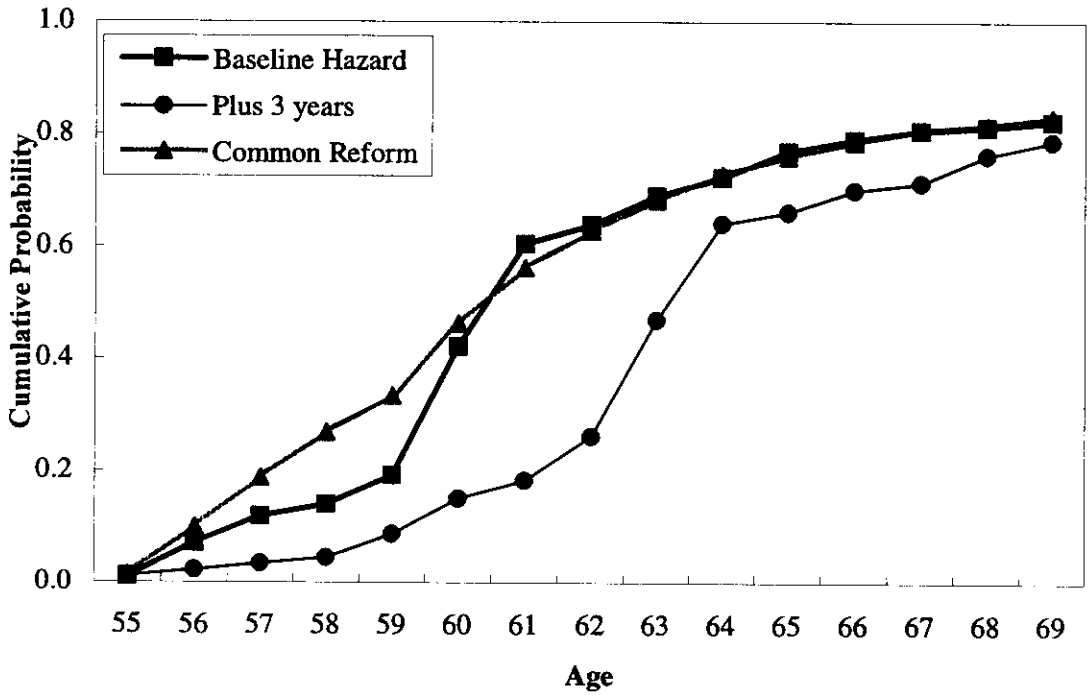


Figure 6a: Simulation S1 on Males using Peak Value Estimates

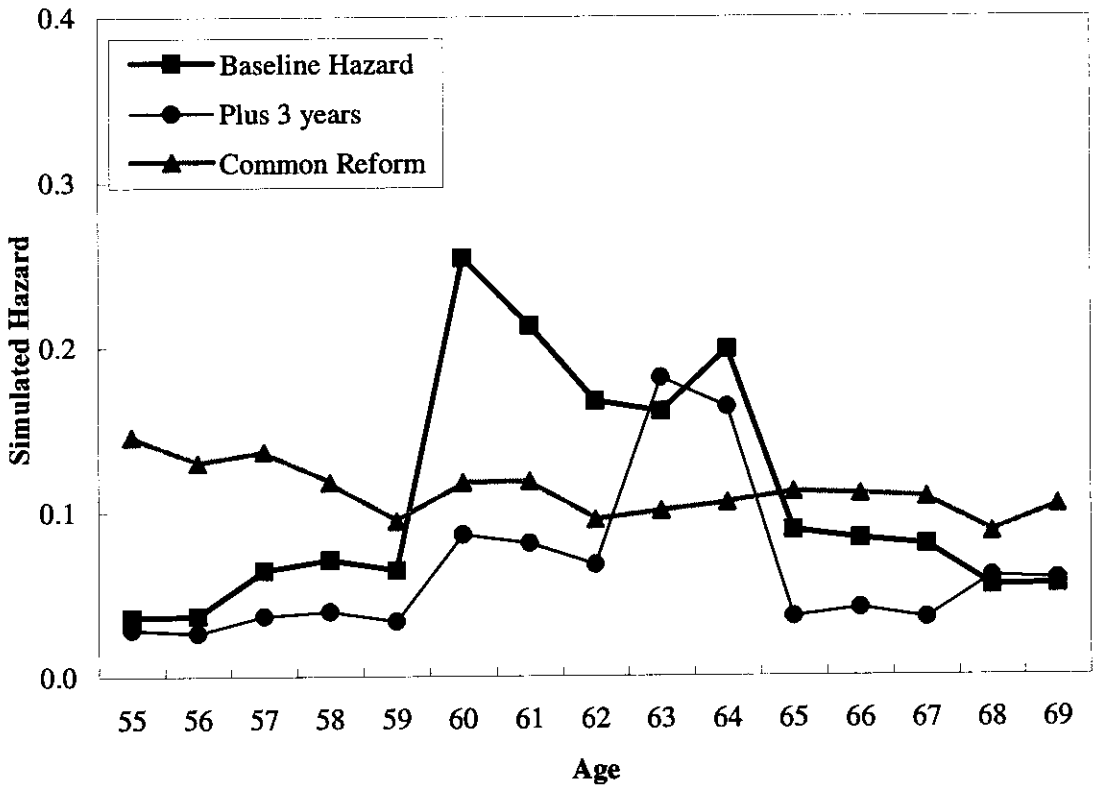


Figure 6b: Simulation S1 on Males using Peak Value Estimates

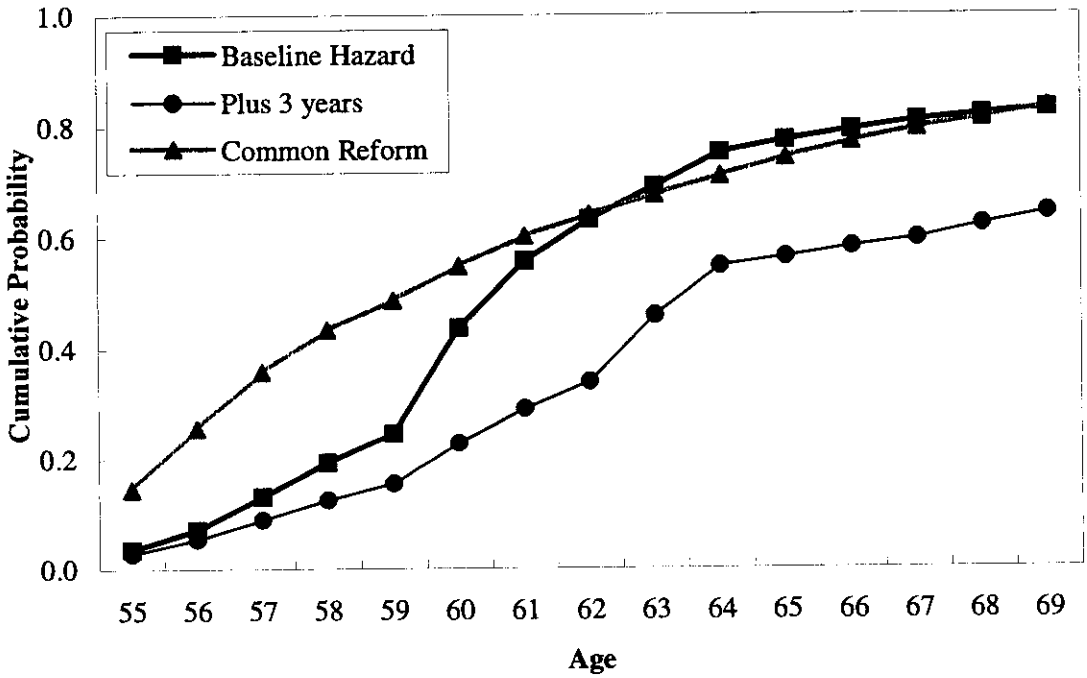


Figure 7a: Simulation S2 on Males using Peak Value Estimates

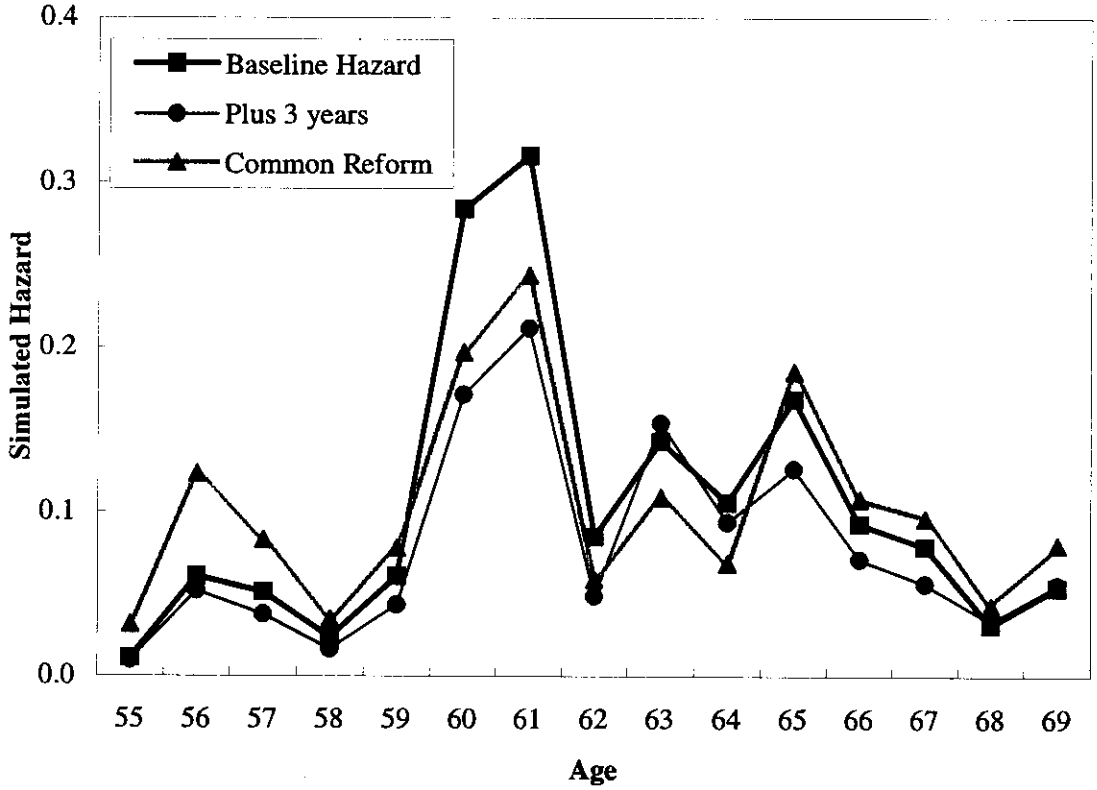


Figure 7b: Simulation S2 on Males using Peak Value Estimates

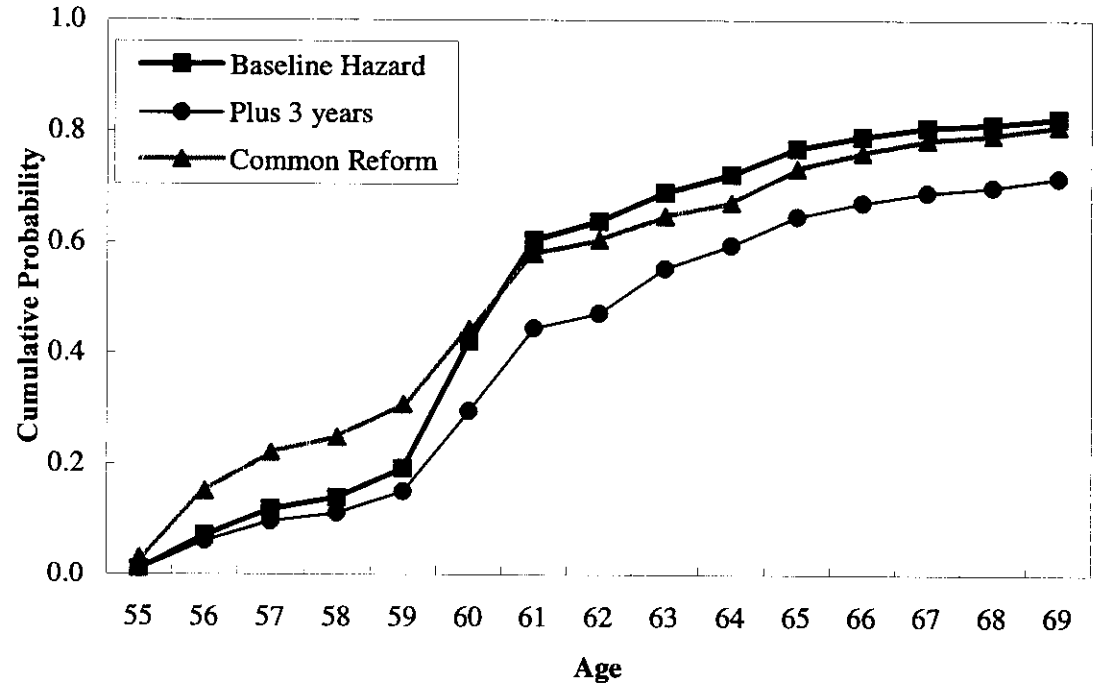


Figure 8a: Simulation S3 on Males using Peak Value Estimates

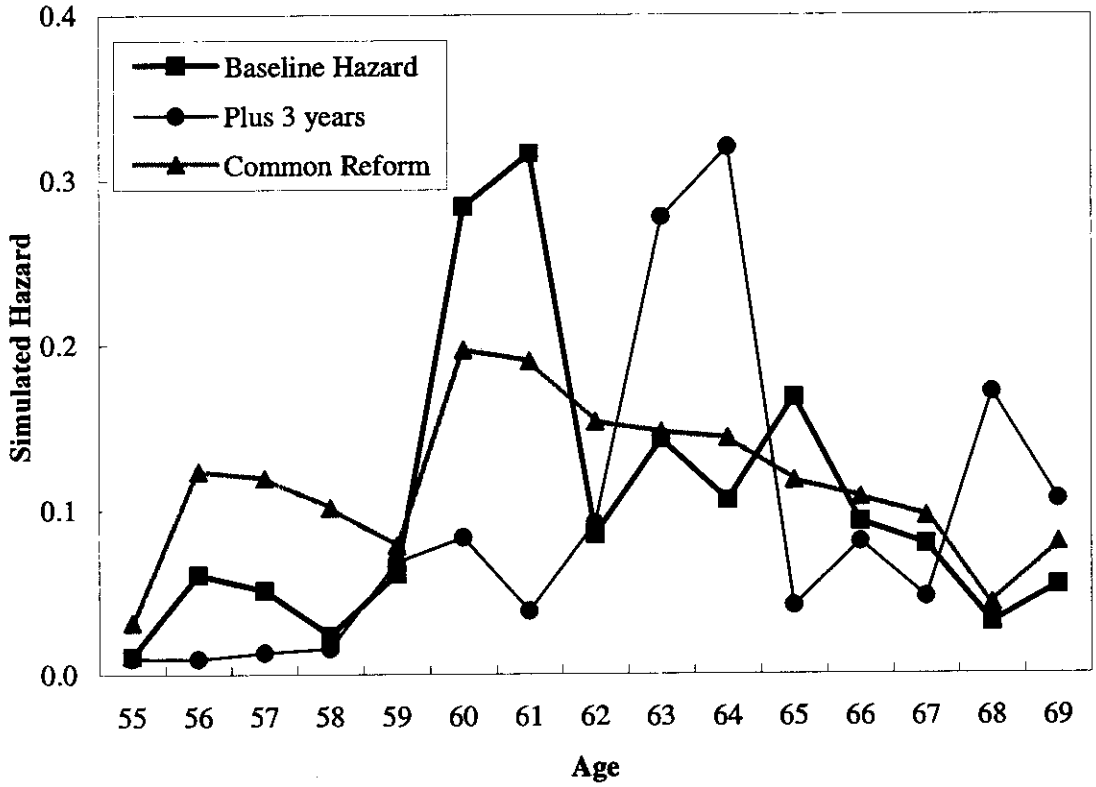


Figure 8b: Simulation S3 on Males using Peak Value Estimates

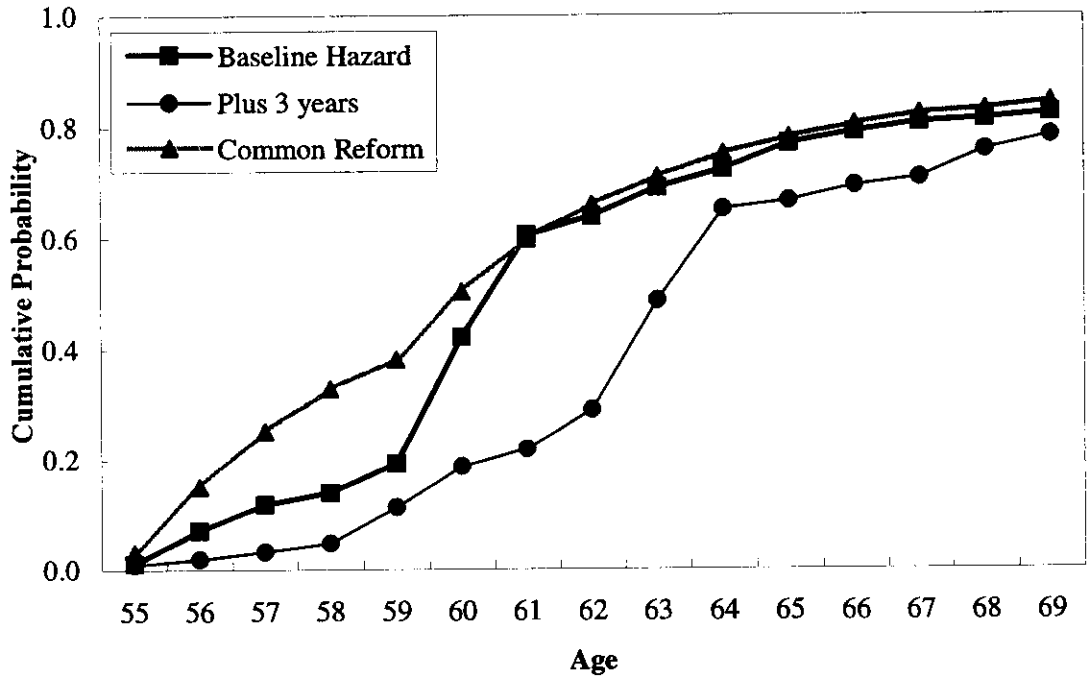


Figure 9a: Simulation S1 on Males using Option Value Estimates

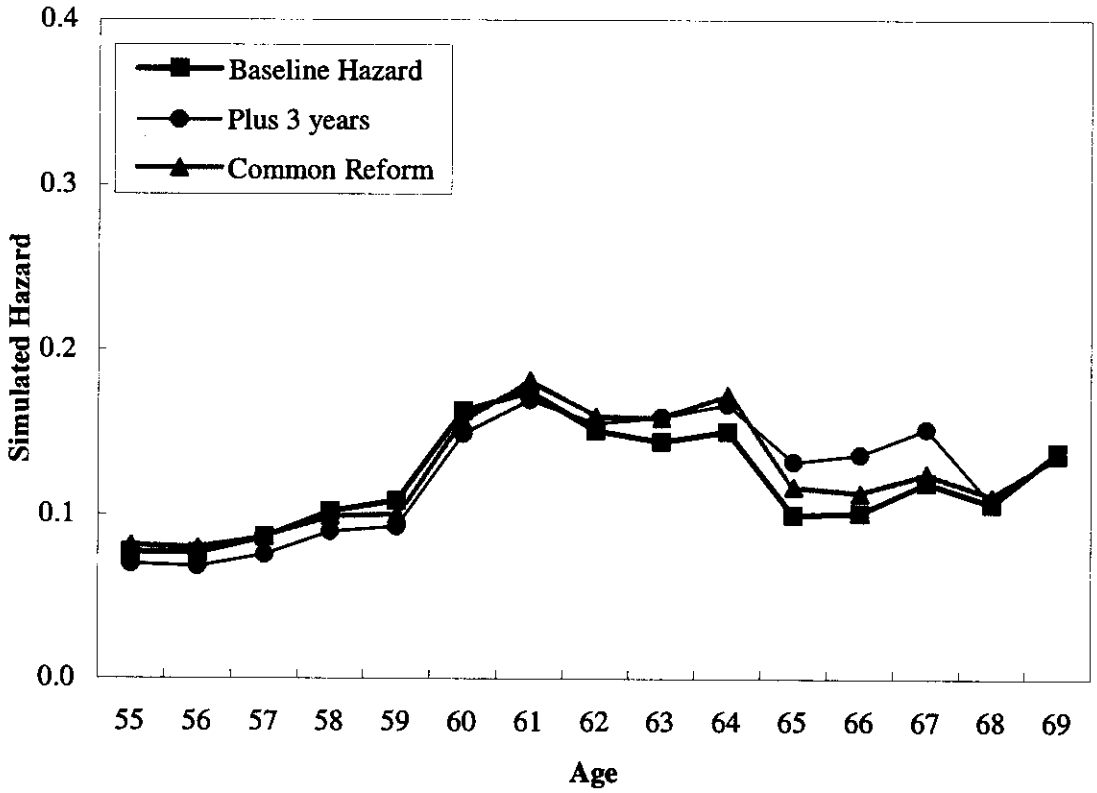


Figure9b: Simulation S1 on Males using Option Value Estimates

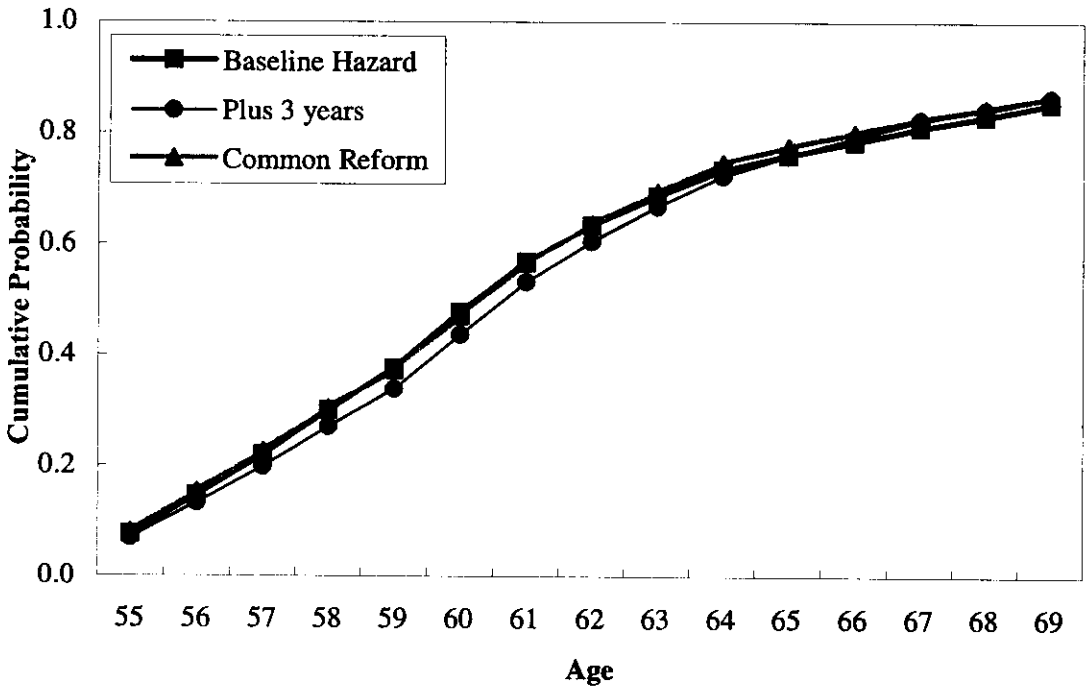


Figure 10a: Simulation S2 on Males using Option Value Estimates

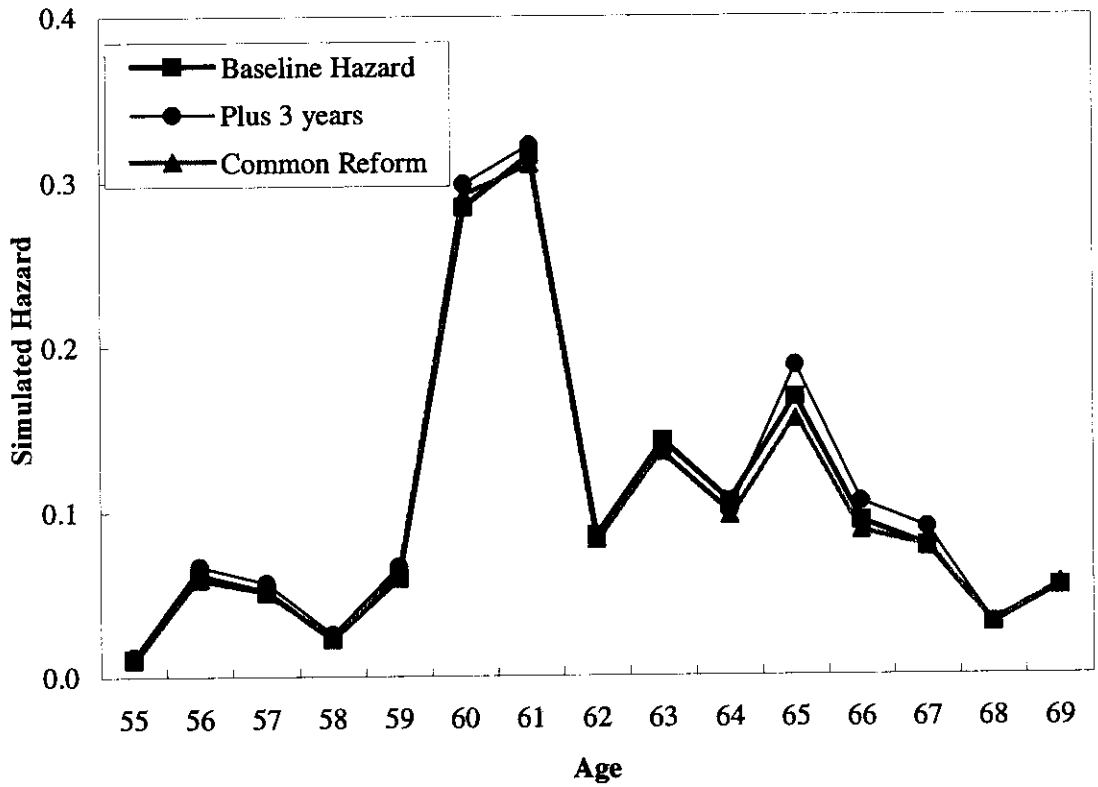


Figure 10b: Simulation S2 on Males using Option Value Estimates

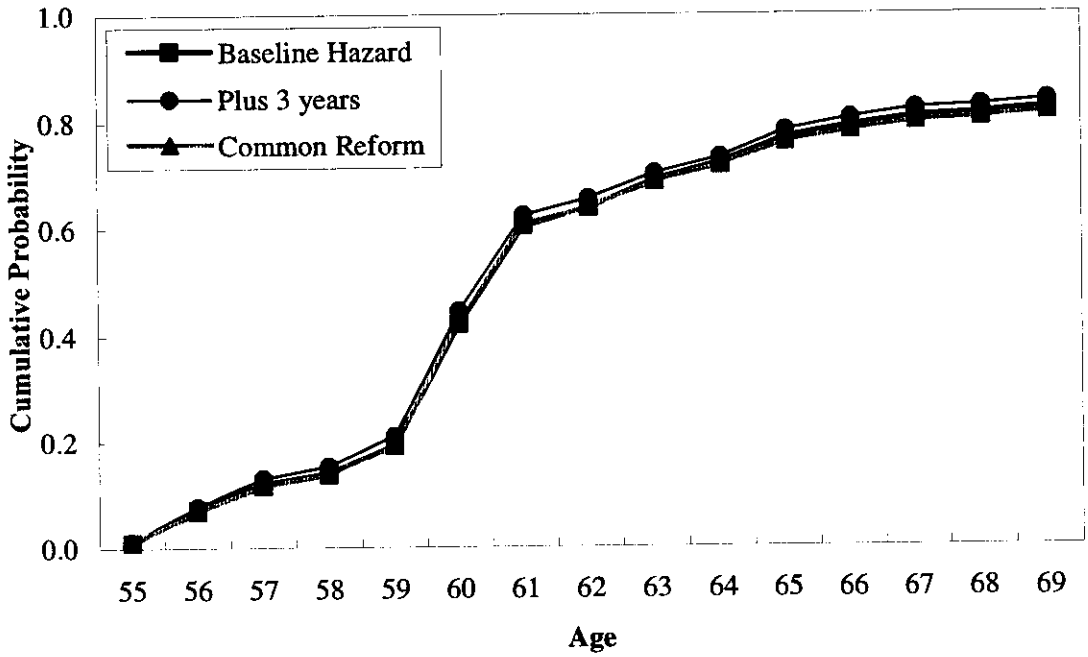


Figure 11a: Simulation S3 on Males using Option Value Estimates

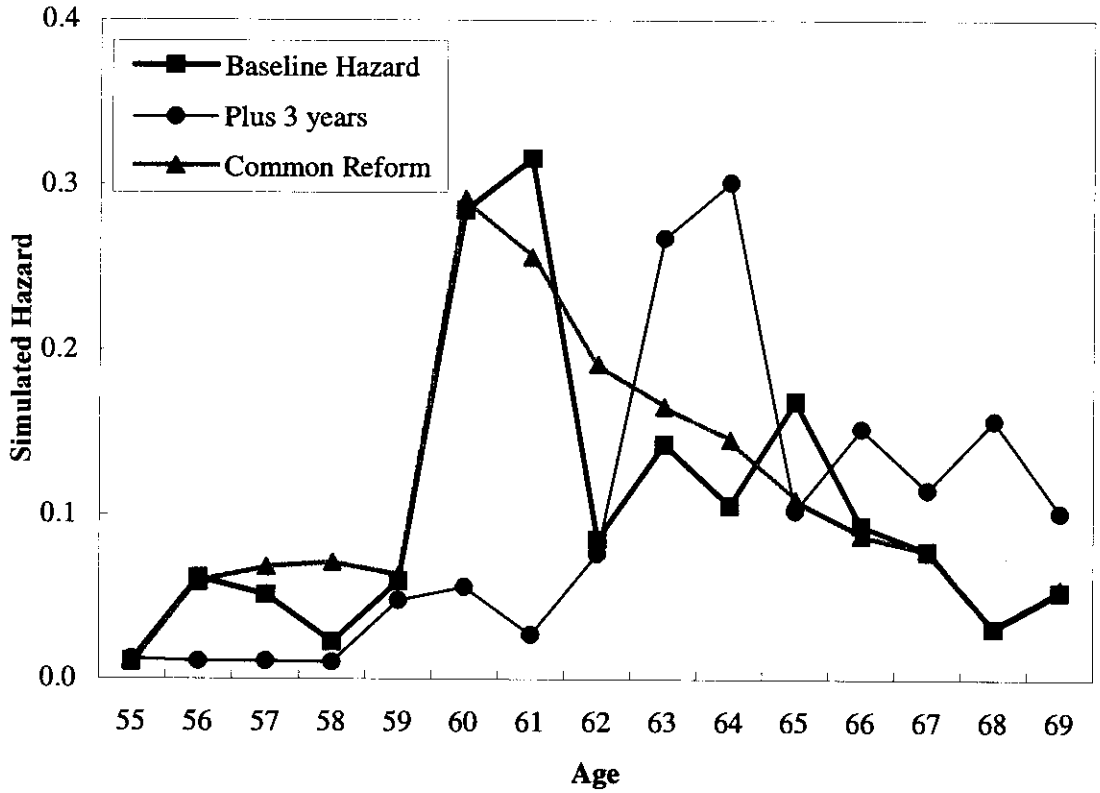


Figure 11b: Simulation S3 on Males using Option Value Estimates

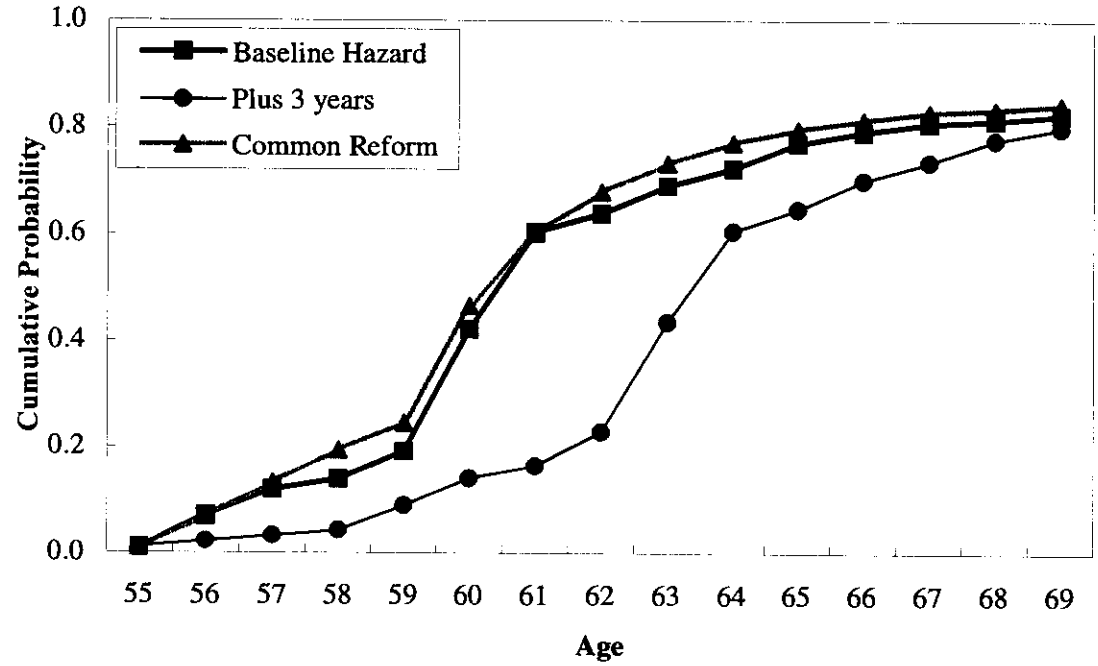


Figure 12a: Simulation S1 on Females using Peak Value Estimates

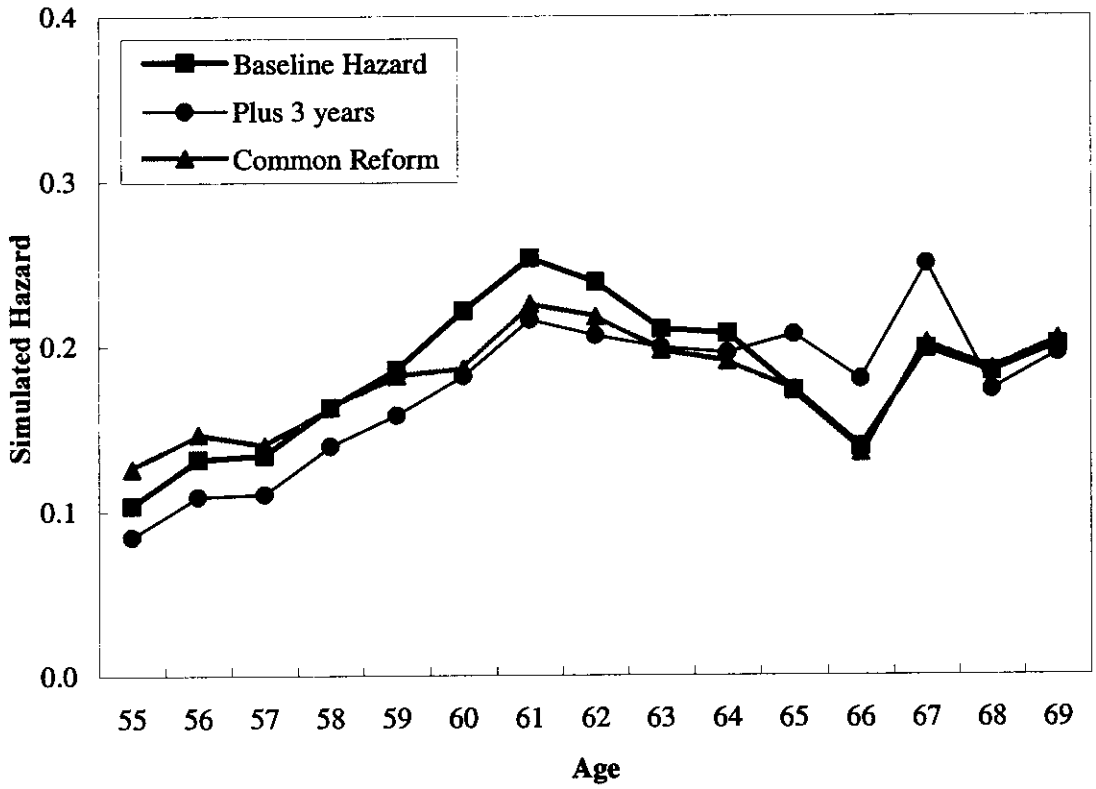


Figure 12b: Simulation S1 on Females using Peak Value Estimates

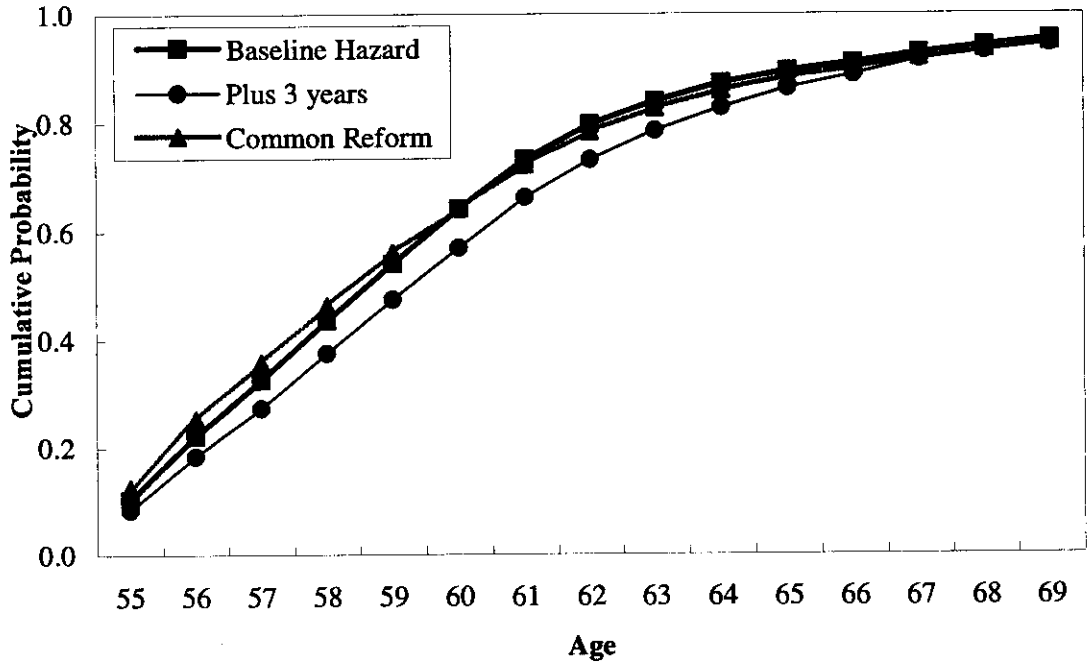


Figure 13a: Simulation S2 on Females using Peak Value Estimates

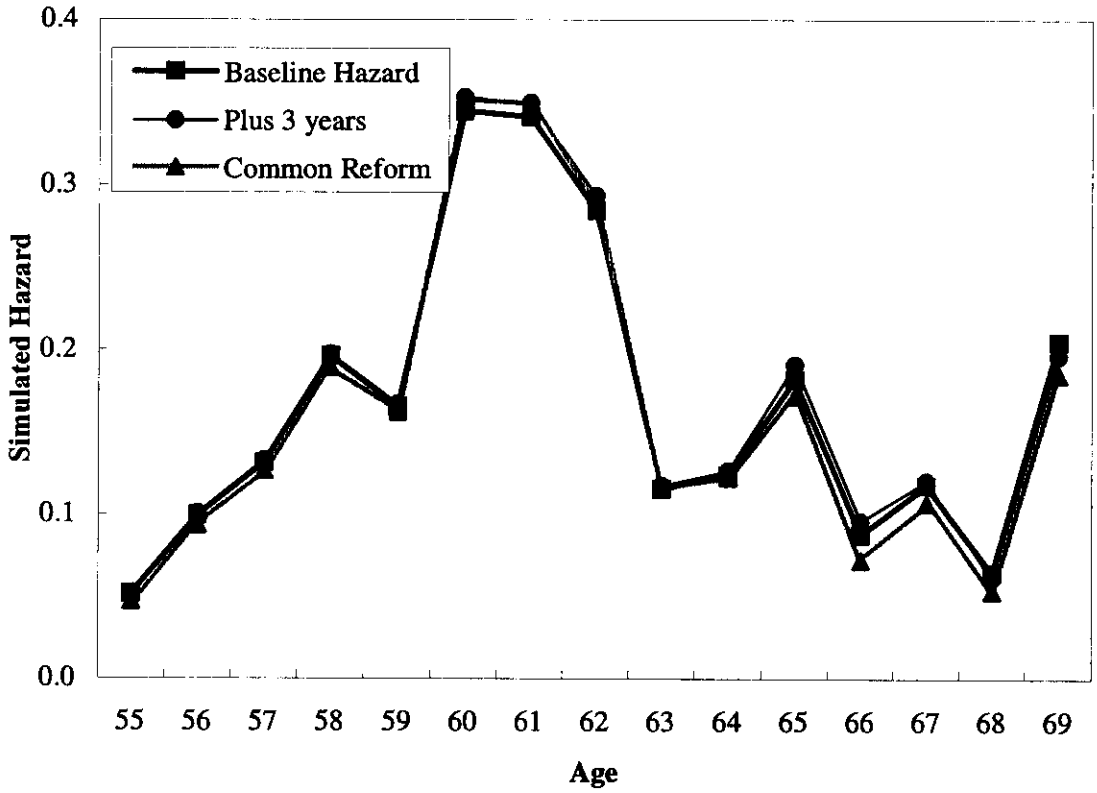


Figure 13b: Simulation S2 on Females using Peak Value Estimates

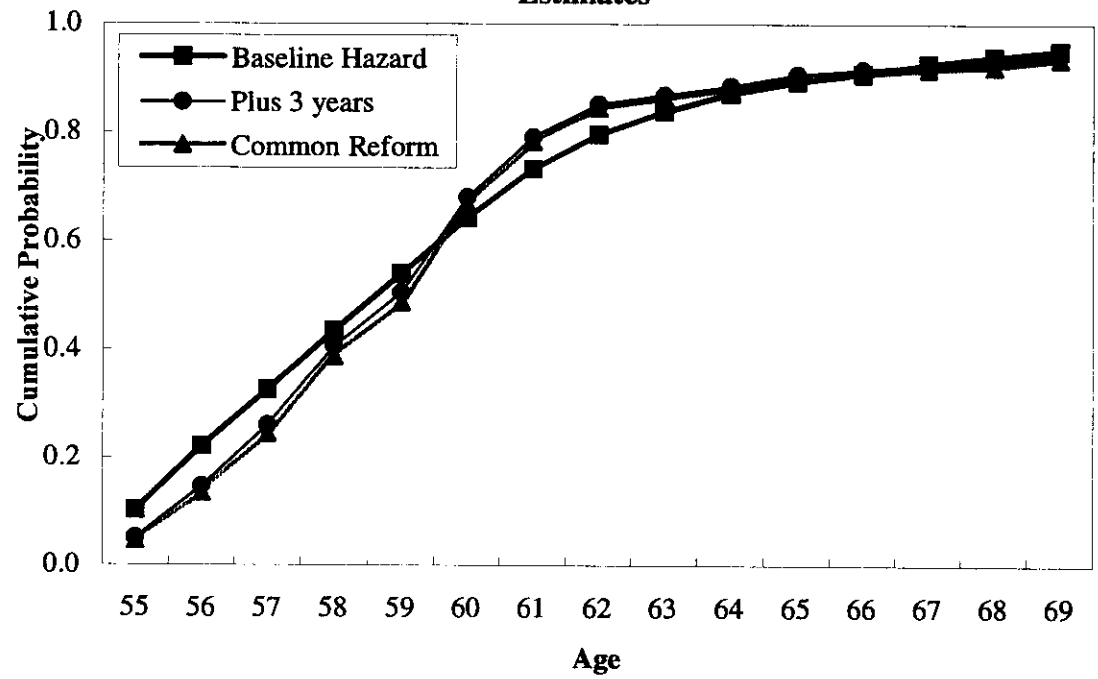


Figure 14a: Simulation S3 on Females using Peak Value Estimates

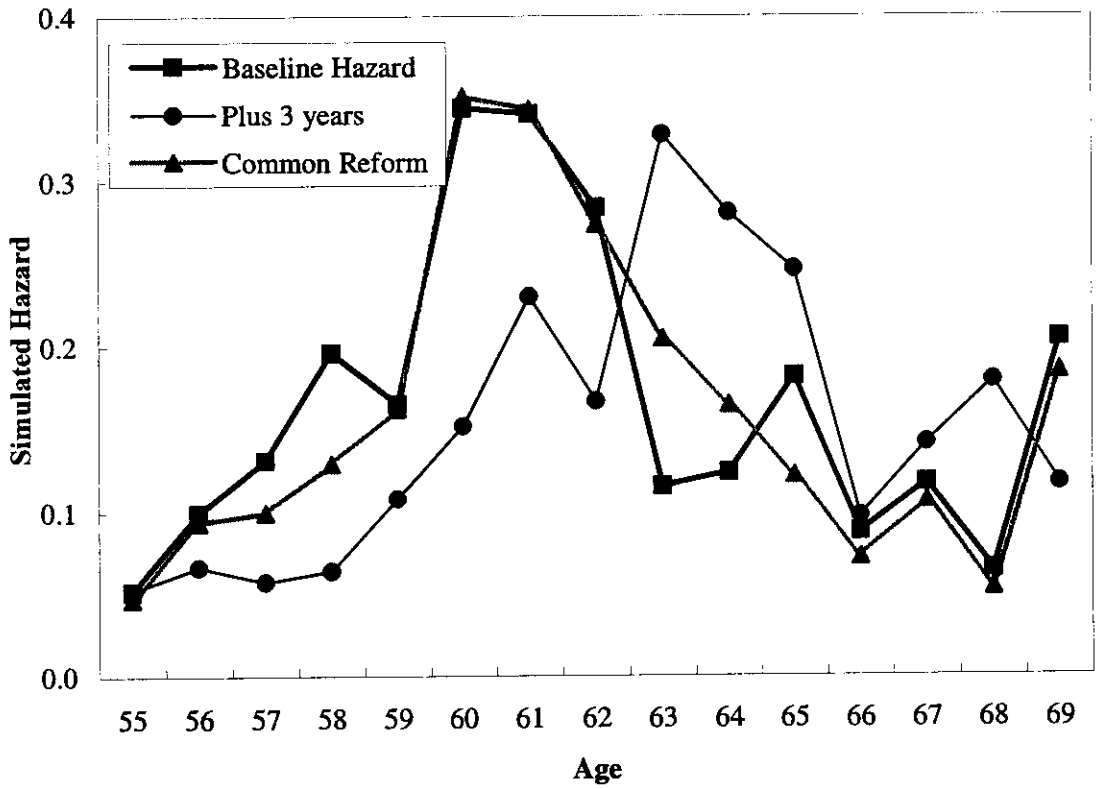
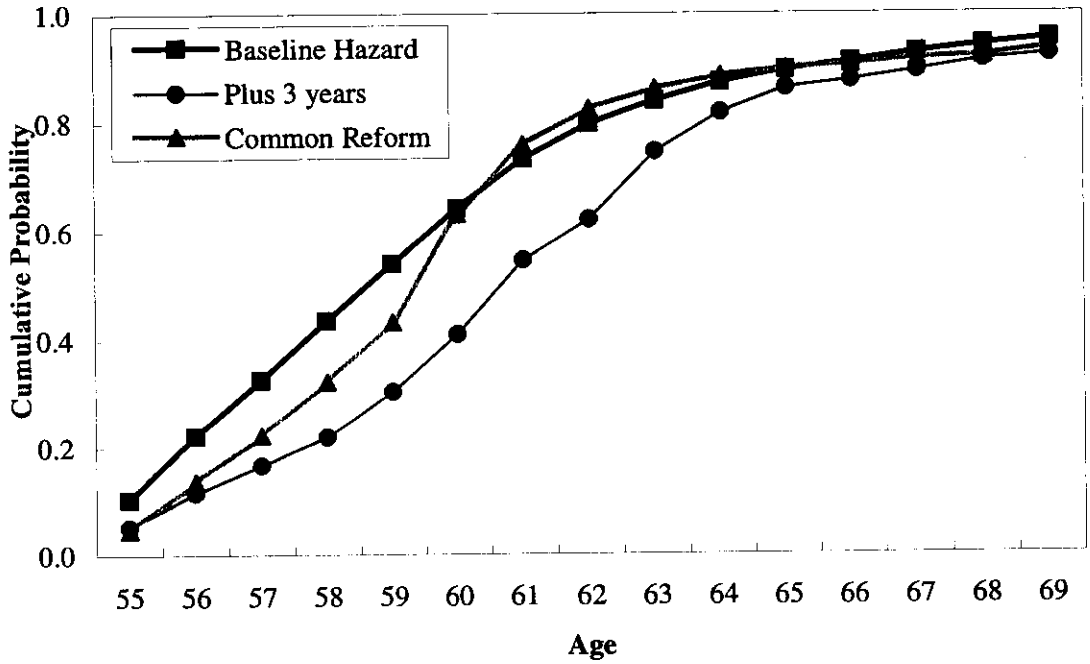


Figure 14b: Simulation S3 on Females using Peak Value Estimates



厚生科学研究費補助金政策科学推進研究事業
「社会経済変化に対応する公的年金制度のあり方に関する実証研究」

Financial Implications of Social Security Reforms in Japan*

First draft

March 31, 2002

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* 本論文における『高年齢者就業実態調査』を使用した計算結果は Oishi and Oshio(2000) において計算された結果を引用したものである。

1. Introduction

As in other OECD countries, public pension insolvency is now one of the most serious problems that an aging society poses for the Japanese economy. The proportion of people aged 65 and above – 17.4 percent in 2000, which is close to the OECD average – is expected to grow faster than in any other advanced country. The latest official population projections, published in January 2002, expect the share of elderly to rise to 28.7 percent in 2025 and 35.7 percent in 2050. These projections assume that the fertility rate will remain low at 1.39 by 2050, expecting no substantial recovery from 1.36 in 2000

Rapid population aging is a big challenge to the sustainability of the social security system, which relies heavily on future generations. Under strong demographic pressures, the government announced a new pension reform plan in 1999 and has implemented it since April in 2000. Since Japan's public pension program is basically a pay-as-you-go system, the government must reduce benefits and/or increase contributions in order to keep the programs financially sustainable. To finance pension benefits promised in the previous 1994 Reform, the contribution rate must eventually increase to 34.5 percent, which seems unacceptable. The 2000 Reform thus incorporates measures to hold down the burden on future generations by making eligibility conditions and benefit schemes less generous than previously scheduled.

Still, the chance that the latest reforms will fail to solve insolvency problems is very high, since they are still based on seemingly overestimated population growth[1] and rosy macroeconomic forecasts. Indeed, several analysts show that the public pension fund would be exhausted by 2050 even with several changes called for by the 2000 Reform. Net pension liabilities are estimated to be 550 trillion yen, about 108% of net GDP, at the end of

[1] The 2000 Reform is based on the previous population projections, which unrealistically expect the fertility rate to smoothly recover to 1.61 by 2050.