Health Status and Health Expectancy for the Elderly in Hong Kong from 2004 to 2008

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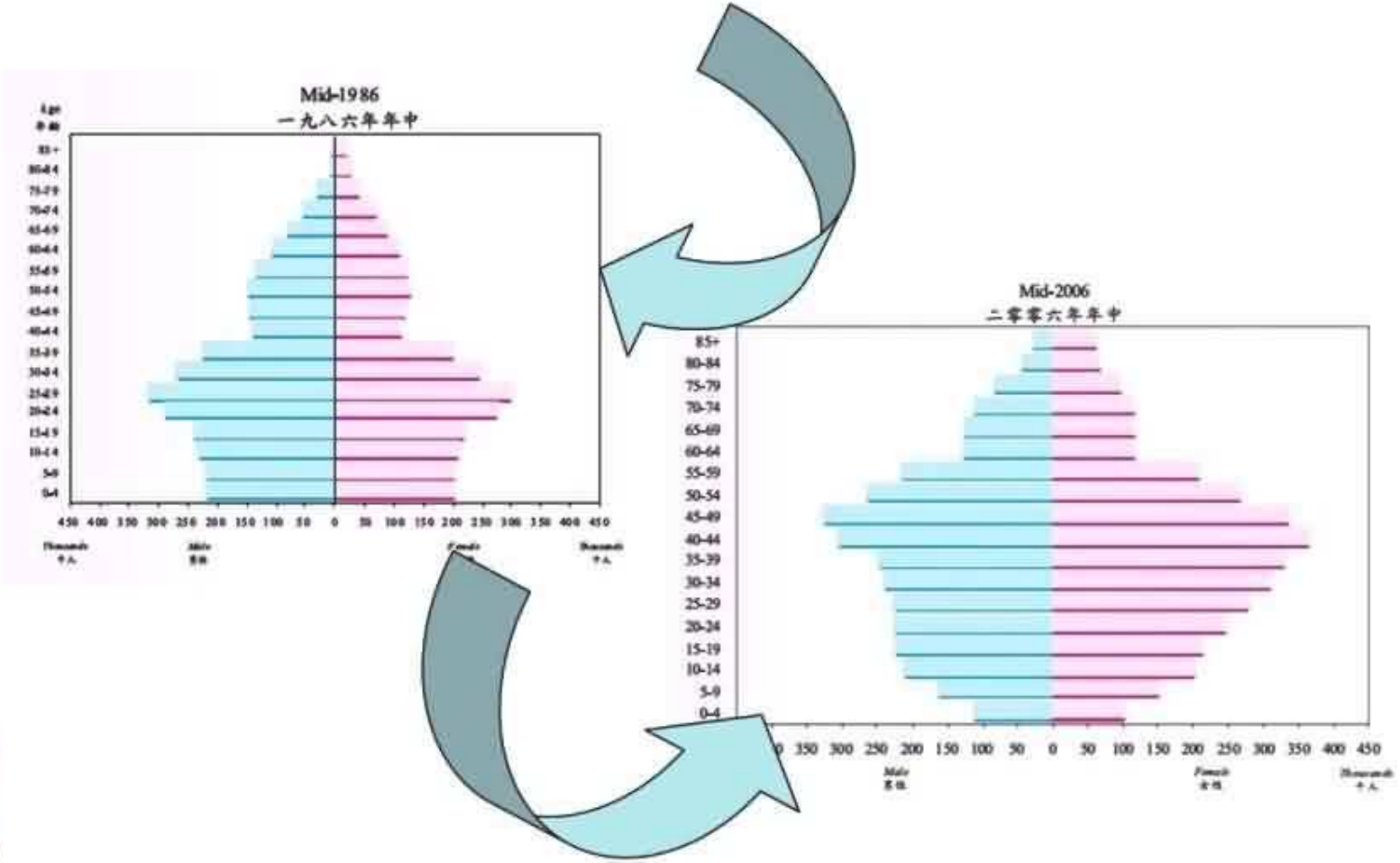
Introduction

Introduction

- Increasing life expectancy
- Chronic diseases remain the major causes of death in HK
- Decreasing fertility and mortality



Questions

- Do the elderly live longer having a longer healthy life or only extending unhealthy life?

- What are the trends of Active Life Expectancy (ALE) for the elderly in Hong Kong?

Methods

Methods

- Longitudinal dataset from 18 Elderly Health Centres (EHCs), Department of Health, HKSAR Government.

- The EHCs provides (1) physical check up and health assessment, (2) counselling and curative treatment, and (3) health promotion and education to the elderly aged 65 and above.

Methods

- Participants were elderly clients who enrolled and followed up in the 18 EHCs during January 2004 to December 2008.
- Clients were interviewed by trained nurses with a standardized questionnaire, and underwent clinical examination by EHC doctors.
- Vital status and causes of death were ascertained from Death Registration, Hospital Authority specialist out-patient and hospitalization databases.

Definition of Heath Status

- Active and inactive states
  - Activities of Daily Living (ADL) (7-items)
  - Instrumental Activities of Daily Living (iADL) (5 items)
- Each item was scored:
  1 mark – perform independently / no need to do so
  2 marks – sometimes need others help / aided
  3 marks – rely on the others help / cannot perform because of poor health condition
- Absorbing state - death

iADL and ADL

- iADL
  1) Using a telephone; 2) Public transport; 3) Shopping; 4) Cooking; 5) Managing finances
- ADL
  1) Taking a bath or shower; 2) Using the toilet; 3) Walking; 4) Getting in/out of bed; 5) Dressing; 6) Eating; 7) Cleaning up
- Classified as:
  (i) functional active if the total scores of iADL and ADL = 12
  (ii) functional disability (inactive) if the total scores of iADL and ADL > 12

Research Design

Research Design

- Interpolation of Markov Chains (IMaCH) program
  - IMaCH program can deal with several waves of data at once and different lengths of intervals between surveys;
  - It produces outputs of total life expectancy and health expectancy by single age and other covariates based on the multistate life table method.
  - Requires 1 data file and 1 parameter file

- The patterns of health transitions among health status were examined;

- The total score of ADL and iADL was used as the major health index for ALE calculation.

Research Design

- Data file for the IMaCH program (source: http://euroreves.ined.fr/imach/doc/imach.htm)

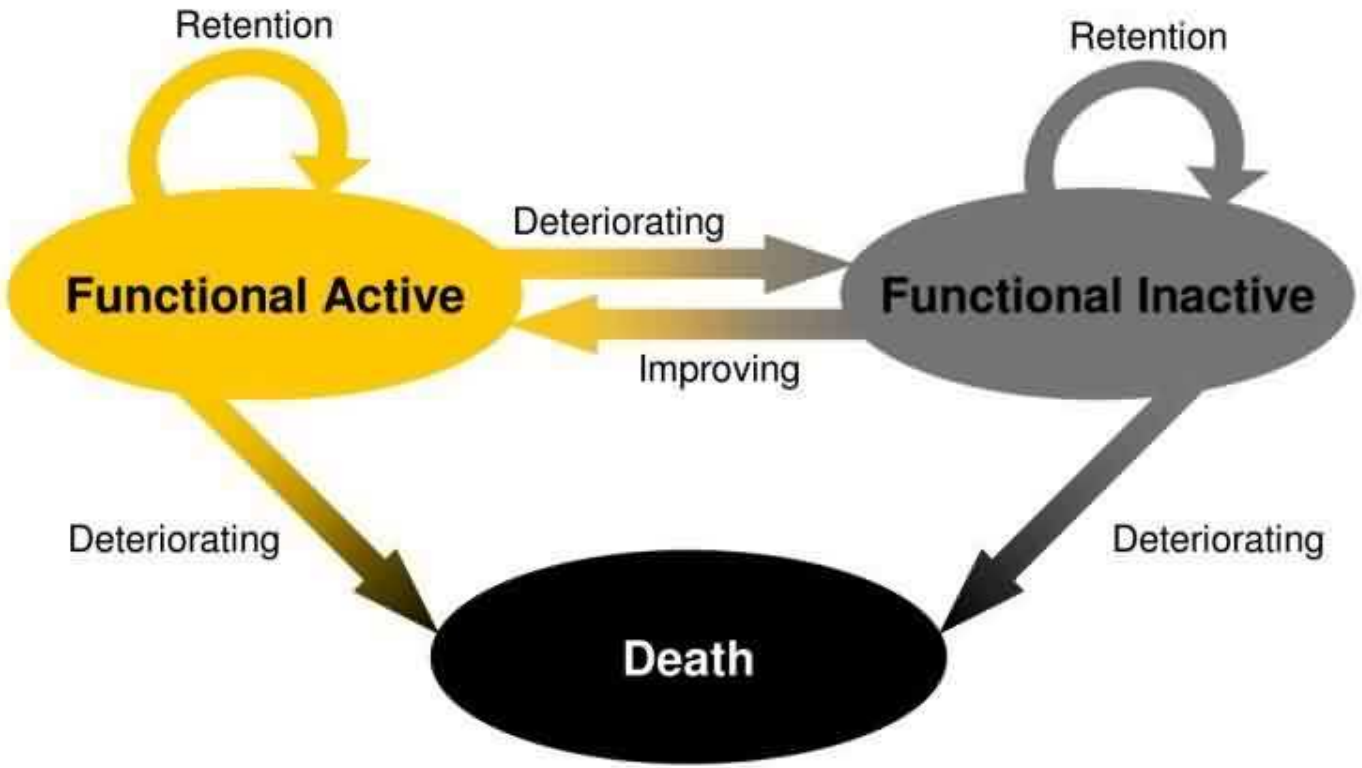
Index number	Positive number
First covariate	
Second covariate	
Weight	
Date of birth	Coded as mm/yyyy; Missing dates are coded as 99/9999
Date of death	
Date of first interview	
Status at first interview	1 = active; 2 = inactive; 3 = died; Missing values are coded "-1"
Date of second interview	Coded as mm/yyyy; Missing dates are coded as 99/9999
Status at second interview	1 = active; 2 = inactive; 3 = died; Missing values are coded "-1"
.....	Coded as mm/yyyy; Missing dates are coded as 99/9999
Date of n^{th} interview	
Status at n^{th} interview	1 = active; 2 = inactive; 3 = died; Missing values are coded "-1"

Research Design

- Parameter file for the IMaCH program (source: http://euroreves.ined.fr/imach/doc/imach.htm)
  - First uncommented line;
  - Second uncommented line;
  - Covariates;
  - Guess values for optimization;
  - Guess values for computing variances;
  - Covariance matrix of parameters;
  - Age range for calculation of stationary prevalence and health expectancy;
  - Computing the cross-sectional prevalence;
  - Population- or status-based health expectancies;
  - Prevalence forecasting (Experimental)
  - Population forecasting (Experimental)

Research Design

- Multistate life table



Research Design

- Health transitions

  Model for the transition probability is the multinomial logistic model where P_{ij} is the probability to be observed in state *j* (Active=A, Inactive=InA, or Death=D) at the second wave conditional to be observed in state *i* (Active=A, Inactive=InA, or Death=D) at the first wave.

Starting Age (x) |

$$\begin{pmatrix} P_{A\to A} & P_{A\to InA} & P_{A\to D} \\ P_{InA\to A} & P_{InA\to InA} & P_{InA\to D} \\ P_{D\to A} & P_{D\to InA} & P_{D\to D} \end{pmatrix}$$

Details please refer: http://euroreves.ined.fr/imach/doc/imach.htm
http://en.wikipedia.org/wiki/Markov_chain

Research Design

- Life expectancy at age x, denoted e_x, is calculated by adding up the probabilities to survive to every age.

$$e_x = \sum_{t=1}^{\infty} {}_tP_x = \sum_{t=0}^{\infty} t \, {}_tP_x \, q_{x+t}$$

where ${}_tp_x$ *is the probability of survival from age x to age x+t;*
and q_{x+t} *is the probability of dying during age x+t*

Details please refer: http://en.wikipedia.org/wiki/Age-adjusted_life_expectancy

Research Design

- Active Life Expectancy and Inactive Life Expectancy
  - It is a natural extension of the life expectancy;
  - By considering not only mortality but also ill-health at particular ages, the remaining number of years can be divided into years spent in good and bad health;
  - Active Life expectancy (ALE) and Inactive Life Expectancy (ILE) were used to represent the two states of one's health expectancy;
  - The Life Expectancy (LE) at age x is the weighted mean of ALE and ILE by the period prevalences at age x, which the sum of the prevalence in state1 and state 2 is equal to one.

Details please refer: http://euroreves.ined.fr/imach/doc/imach.htm
http://en.wikipedia.org/wiki/Healthy_Life_Years

Results

Description of cohort at different waves

	2004 (Baseline)	2005 (Wave 1)	2006 (Wave 2)	2007 (Wave 3)	2008 (Wave 4)
Sample Base	**39,593**	**39,416**	**38,873**	**38,219**	**37,504**
-new enrolment	4,622 (11.7%)	N.A.	N.A.	N.A.	N.A.
-follow-up	34,971 (88.3%)	22,121 (56.1%)	21,343 (54.9%)	20,833 (54.5%)	17,429 (46.5%)
Attrition					
-No. of death during last year	N.A.	177 (0.44%)	543 (1.38%)	654 (1.71%)	715 (1.87%)
-No. of elderly did not come to the centers that year	N.A.	17,293 (43.9%)	17,530 (45.1%)	17,386 (45.5%)	20,075 (53.5%)
-Refused to come	N.A.	1	---	---	---
-Institutionalization	N.A.	1	---	---	---
Crude death rate (per 1,000 persons)	N.A.	4.5	13.8	16.8	18.7
Mean age	**74.3**	**75.1**	**75.9**	**76.7**	**77.5**
Gender (%)					
- Male	35.9	36.3	36.2	35.9	36.0
- Female	64.1	63.7	63.8	64.1	64.0

Description of cohort at different waves

	2004 (Baseline)	2005 (Wave 1)	2006 (Wave 2)	2007 (Wave 3)	2008 (Wave 4)
Sample Base • new enrolment • Follow-up	**39,593** 4,622 34,971	**39,416** N.A. 22,121	**38,873** N.A. 21,343	**38,219** N.A. 20,833	**37,504** N.A. 17,429
No. of respondents who visited the EHCs last year	N.A.	**22,121** (100.0%)	**9,817** (46.0%)	**10,390** (49.9%)	**8,729** (50.1%)

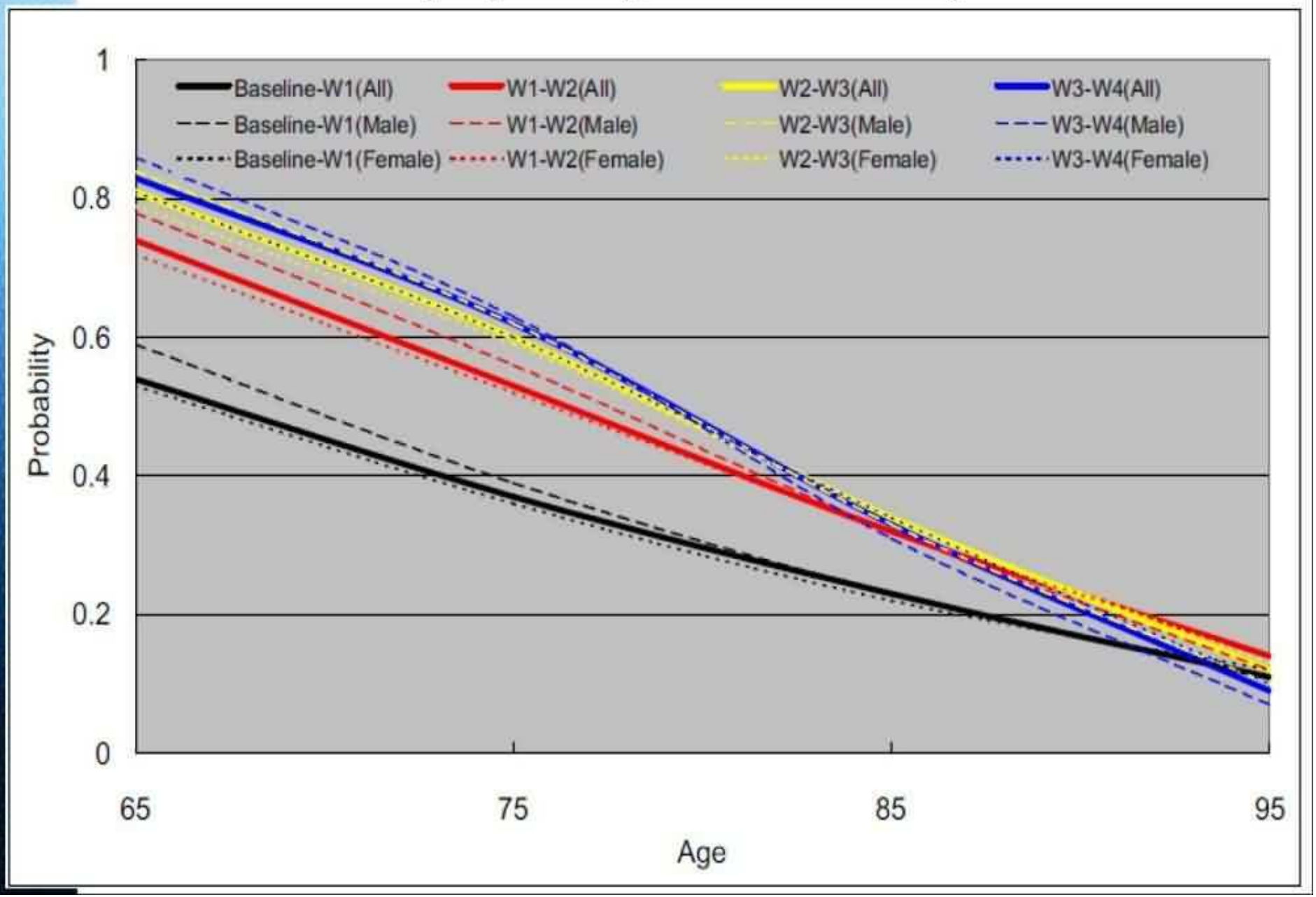
Frequency	No. of respondents visited the EHCs during 2004-2008
Once *(i.e. only visited in 2004)*	5,116
Twice	4,530
3 times	13,697
4 times	15,198
5 times	1,052

Note: the interval between each visit can be one year or more than one year.

Probability of Health Transitions by Gender (Improving Health: InA-A)

Health Transitions	Improving (InA→A)			
	Baseline-W1	W1-W2	W2-W3	W3-W4
Overall				
Age 65	0.54	0.74	0.81	0.83
Age 75	0.37	0.53	0.60	0.62
Age 85	0.23	0.32	0.34	0.33
Age 95	0.11	0.14	0.12	0.09
Male				
Age 65	0.59	0.78	0.84	0.86
Age 75	0.39	0.56	0.62	0.63
Age 85	0.23	0.32	0.33	0.31
Age 95	0.11	0.12	0.10	0.07
Female				
Age 65	0.53	0.72	0.79	0.81
Age 75	0.36	0.52	0.59	0.60
Age 85	0.22	0.32	0.34	0.34
Age 95	0.12	0.14	0.13	0.10

Probability of Health Transitions by Gender (Improving Health: InA-A)



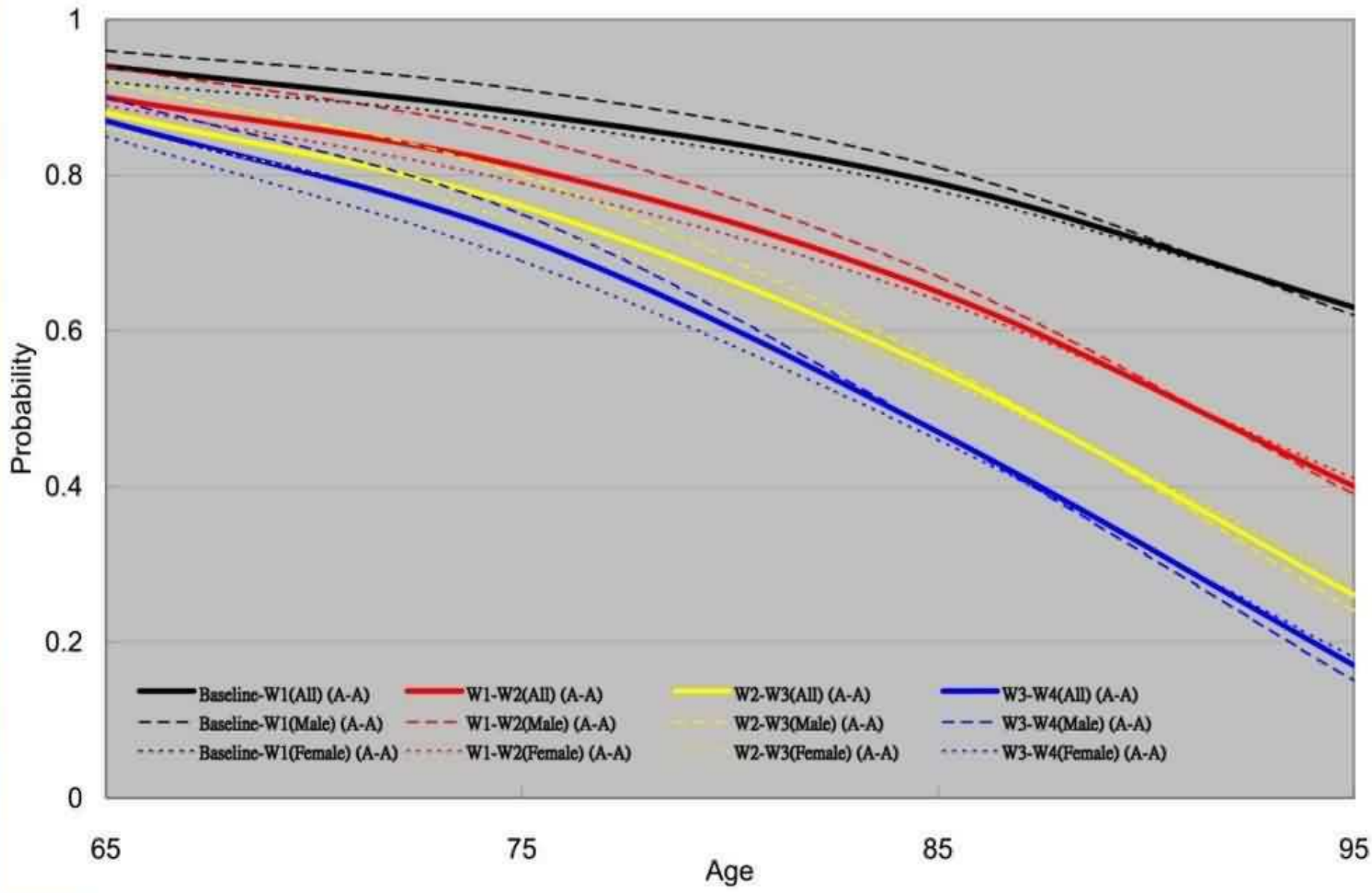
Probability of Health Transitions by Gender (Retention: A-A)

Health Transitions	Retention (A→A)			
	Baseline-W1	W1-W2	W2-W3	W3-W4
Overall				
Age 65	0.94	0.90	0.88	0.87
Age 75	0.88	0.81	0.76	0.72
Age 85	0.79	0.65	0.55	0.47
Age 95	0.63	0.40	0.26	0.17
Male				
Age 65	0.96	0.94	0.92	0.90
Age 75	0.91	0.85	0.80	0.75
Age 85	0.81	0.67	0.56	0.47
Age 95	0.62	0.39	0.24	0.15
Female				
Age 65	0.92	0.89	0.86	0.85
Age 75	0.87	0.79	0.74	0.69
Age 85	0.78	0.64	0.54	0.46
Age 95	0.63	0.41	0.28	0.18

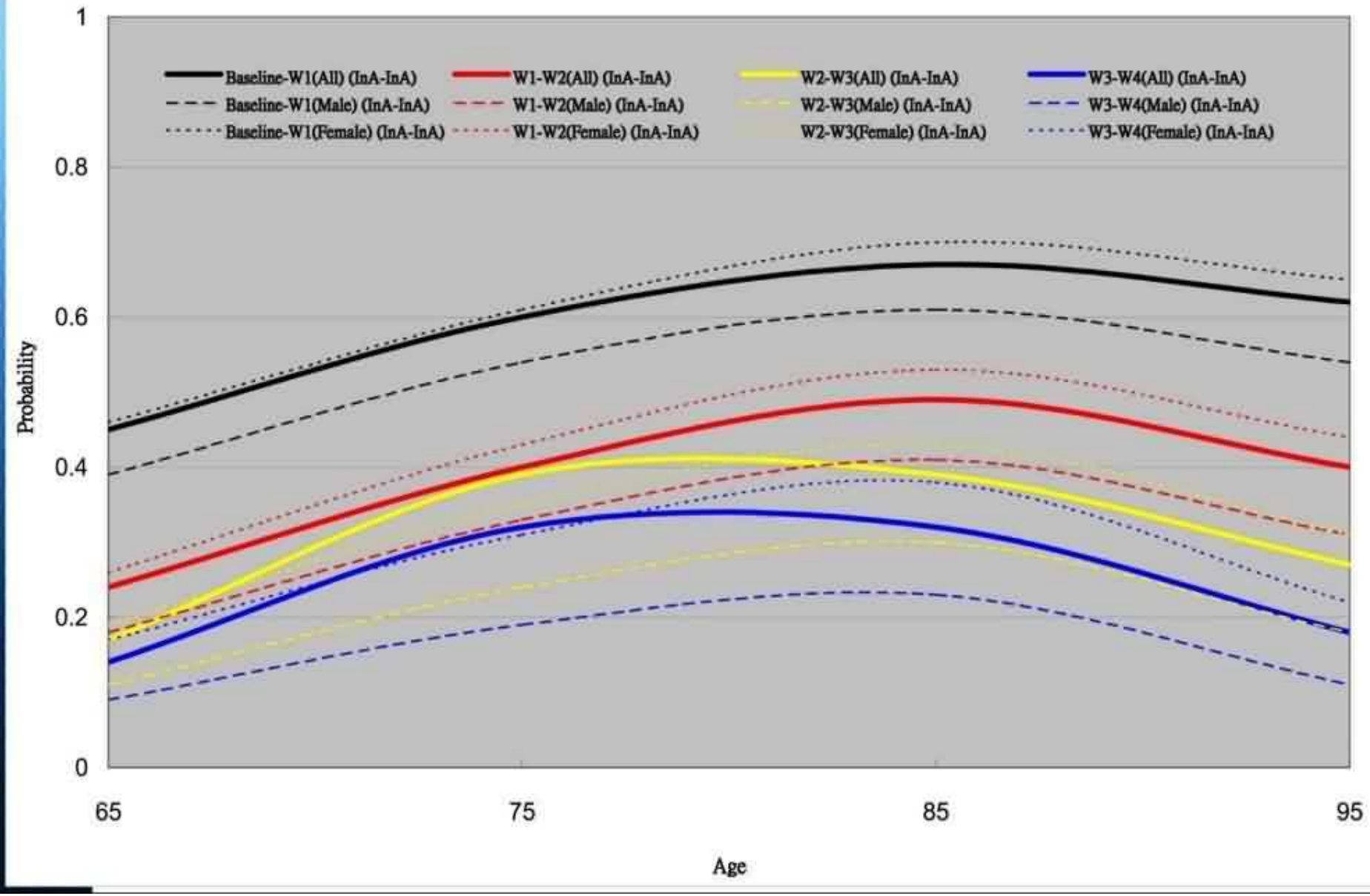
Probability of Health Transitions by Gender (Retention: InA-InA)

Health Transitions	Retention (InA→InA)			
	Baseline-W1	W1-W2	W2-W3	W3-W4
Overall				
Age 65	0.45	0.24	0.17	0.14
Age 75	0.60	0.40	0.31	0.27
Age 85	0.67	0.49	0.39	0.32
Age 95	0.62	0.40	0.27	0.18
Male				
Age 65	0.39	0.18	0.11	0.09
Age 75	0.54	0.33	0.24	0.19
Age 85	0.61	0.41	0.30	0.23
Age 95	0.54	0.31	0.18	0.11
Female				
Age 65	0.46	0.26	0.19	0.17
Age 75	0.61	0.43	0.35	0.31
Age 85	0.70	0.53	0.43	0.38
Age 95	0.65	0.44	0.31	0.22

Probability of Health Transitions by Gender (Retention: A-A)



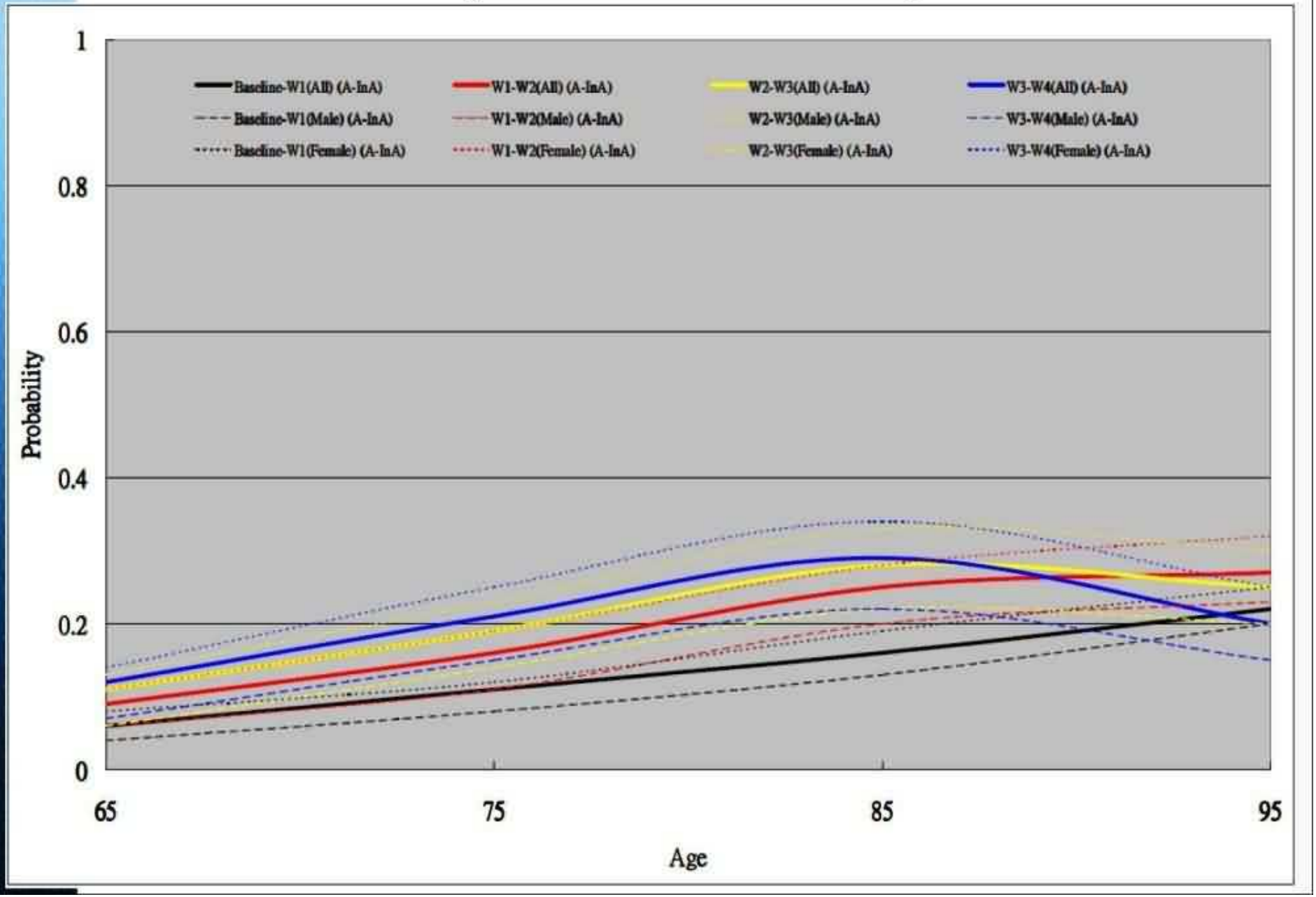
Probability of Health Transitions by Gender (Retention: InA-InA)



Probability of Health Transitions by Gender (Deterioration: A-InA)

Health Transitions	Deteriorating (A→InA)			
	Baseline-W1	W1-W2	W2-W3	W3-W4
Overall				
Age 65	0.06	0.09	0.11	0.12
Age 75	0.11	0.16	0.19	0.21
Age 85	0.16	0.25	0.28	0.29
Age 95	0.22	0.27	0.25	0.20
Male				
Age 65	0.04	0.06	0.06	0.07
Age 75	0.08	0.11	0.14	0.15
Age 85	0.13	0.20	0.22	0.22
Age 95	0.20	0.23	0.20	0.15
Female				
Age 65	0.08	0.11	0.13	0.14
Age 75	0.12	0.19	0.23	0.25
Age 85	0.19	0.28	0.33	0.34
Age 95	0.25	0.32	0.30	0.25

Probability of Health Transitions by Gender (Deterioration: A-InA)



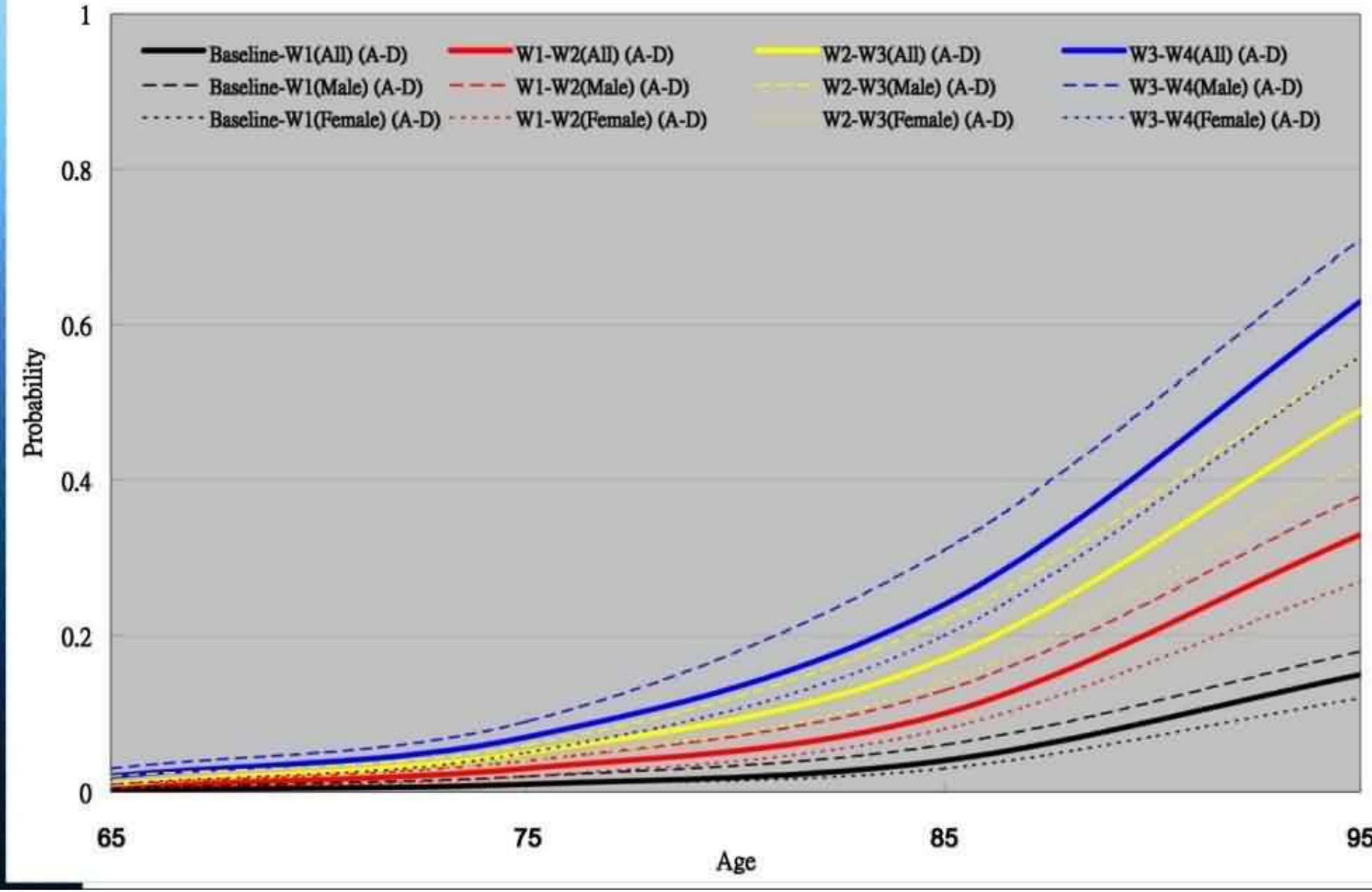
Probability of Health Transitions by Gender (Deterioration: A-D)

Health Transitions	Deteriorating (A→D)			
	Baseline-W1	W1-W2	W2-W3	W3-W4
Overall				
Age 65	0.003	0.007	0.01	0.02
Age 75	0.01	0.03	0.05	0.07
Age 85	0.04	0.10	0.17	0.24
Age 95	0.15	0.33	0.49	0.63
Male				
Age 65	0.005	0.01	0.02	0.03
Age 75	0.02	0.04	0.06	0.09
Age 85	0.06	0.13	0.22	0.31
Age 95	0.18	0.38	0.56	0.71
Female				
Age 65	0.002	0.004	0.01	0.01
Age 75	0.01	0.02	0.04	0.05
Age 85	0.03	0.08	0.14	0.20
Age 95	0.12	0.27	0.42	0.56

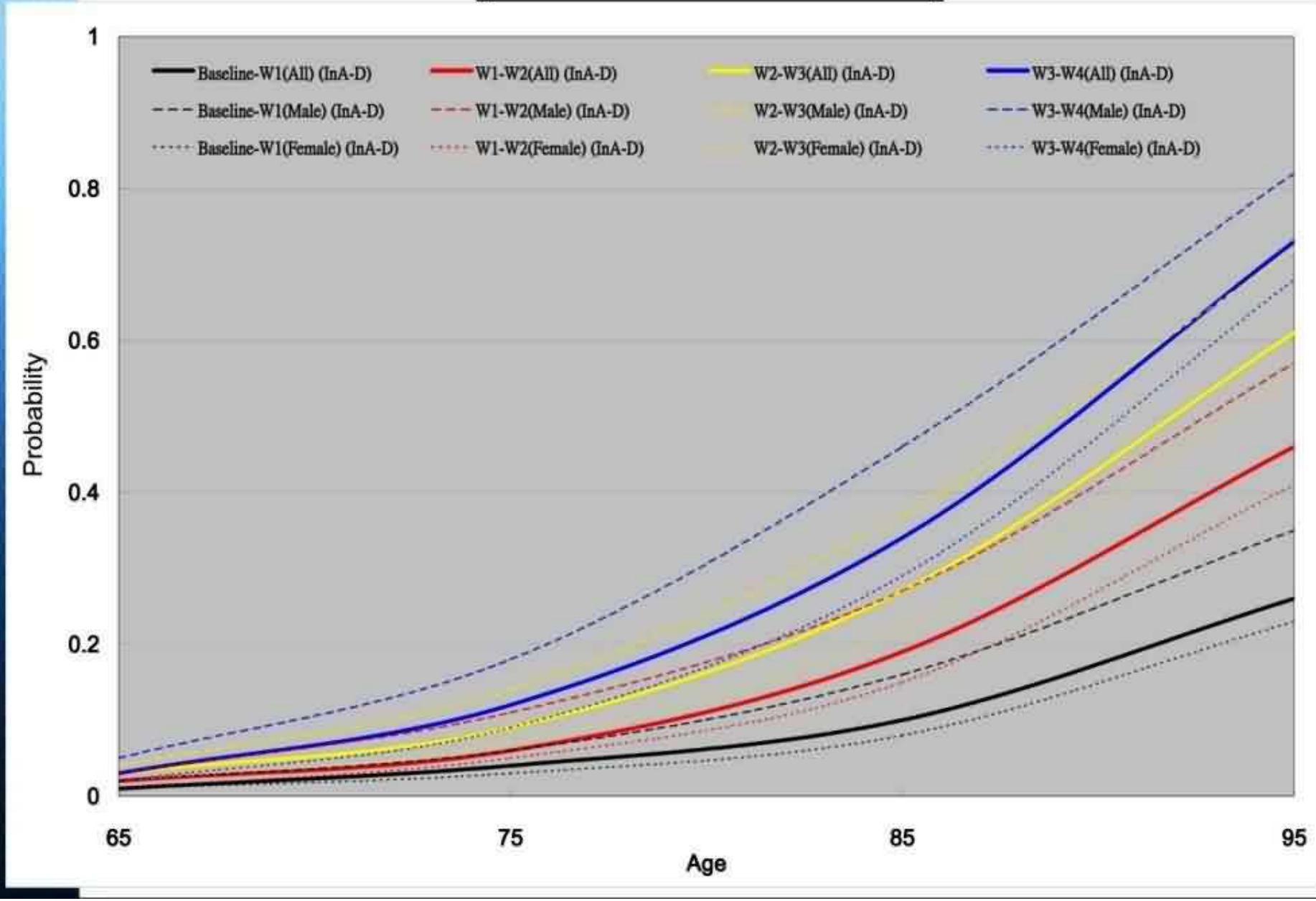
Probability of Health Transitions by Gender (Deterioration: InA-D)

Health Transitions	Deteriorating (InA→D)			
	Baseline-W1	W1-W2	W2-W3	W3-W4
Overall				
Age 65	0.01	0.02	0.03	0.03
Age 75	0.04	0.06	0.09	0.12
Age 85	0.10	0.19	0.27	0.34
Age 95	0.26	0.46	0.61	0.73
Male				
Age 65	0.02	0.03	0.04	0.05
Age 75	0.06	0.11	0.14	0.18
Age 85	0.16	0.27	0.37	0.46
Age 95	0.35	0.57	0.72	0.82
Female				
Age 65	0.01	0.01	0.02	0.02
Age 75	0.03	0.05	0.07	0.09
Age 85	0.08	0.15	0.22	0.29
Age 95	0.23	0.41	0.56	0.68

Probability of Health Transitions by Gender (Deterioration: A-D)



Probability of Health Transitions by Gender (Deterioration: InA-D)



Active Life Expectancy (ALE) - Overall

	LE	ALE	ILE	% of ALE
	2004-2008 (Baseline→W4) Functional Ability - Overall			
Age 65	22.75	17.23	5.52	75.7
Age 75	14.11	9.53	4.58	67.6
Age 85	7.33	4.13	3.21	56.3
Age 95	3.18	1.36	1.82	42.8
	2004-2005 (Baseline→W1) Functional Ability - Overall			
Age 65	23.07	18.08	4.98	78.4
Age 75	14.52	10.33	4.19	71.1
Age 85	8.09	5.09	3.00	62.9
Age 95	4.16	2.34	1.82	56.3
	2005-2006 (W1→W2) Functional Ability - Overall			
Age 65	22.74	17.90	4.84	78.7
Age 75	14.06	10.05	4.01	71.5
Age 85	7.36	4.65	2.71	63.2
Age 95	3.22	1.82	1.40	56.5
	2006-2007 (W2→W3) Functional Ability - Overall			
Age 65	22.69	17.07	5.62	75.2
Age 75	14.12	9.27	4.85	65.7
Age 85	7.21	3.83	3.38	53.1
Age 95	3.02	1.29	1.73	42.7
	2007-2008 (W3→W4) Functional Ability - Overall			
Age 65	20.58	16.68	3.90	81.1
Age 75	12.29	9.12	3.17	74.2
Age 85	6.02	3.92	2.10	65.1
Age 95	2.44	1.38	1.06	56.6

Active Life Expectancy (ALE) by Gender

	LE		ALE		ILE		% of ALE	
	Male	Female	Male	Female	Male	Female	Male	Female
	2004-2008 (Baseline→W4) Functional Ability - Male/Female							
Age 65	20.76	24.22	17.28	17.25	3.48	6.97	83.2	71.2
Age 75	12.49	15.32	9.49	9.58	3.00	5.74	76.0	62.5
Age 85	6.27	8.13	4.06	4.17	2.22	3.96	64.7	51.3
Age 95	2.68	3.55	1.33	1.38	1.35	2.16	49.7	39.0
	2004-2005 (Baseline→W1) Functional Ability - Male/Female							
Age 65	20.18	24.81	17.19	18.20	2.99	6.61	85.2	73.4
Age 75	12.11	15.97	9.56	10.73	2.55	5.24	78.9	67.2
Age 85	6.28	8.75	4.42	5.15	1.86	3.60	70.4	58.9
Age 95	2.95	3.98	1.81	1.86	1.14	2.12	61.4	46.7
	2005-2006 (W1→W2) Functional Ability – Male/Female							
Age 65	20.46	24.16	17.56	18.01	2.90	6.15	85.8	74.5
Age 75	11.97	15.54	9.45	10.45	2.52	5.09	78.9	67.2
Age 85	5.88	8.09	4.06	4.87	1.83	3.22	69.1	60.2
Age 95	2.63	3.17	1.55	1.75	1.08	1.42	58.9	55.2
	2006-2007 (W2→W3) Functional Ability - Male/Female							
Age 65	20.61	24.29	17.02	17.84	3.59	6.45	82.6	73.4
Age 75	12.29	15.25	9.09	10.09	3.20	5.16	74.0	66.2
Age 85	6.04	7.74	3.62	4.58	2.42	3.16	59.9	59.2
Age 95	2.52	2.82	1.04	1.52	1.48	1.30	41.3	53.9
	2007-2008 (W3→W4) Functional Ability - Male/Female							
Age 65	18.25	22.33	8.62	17.14	9.63	5.19	47.2	76.8
Age 75	10.23	13.84	4.84	9.61	5.39	4.23	47.3	69.4
Age 85	4.49	7.16	2.13	4.29	2.36	2.87	47.4	59.9
Age 95	1.49	3.06	0.71	1.53	0.78	1.53	47.7	50.0


Limitations

Limitations

- EHCs tend to attract healthier clients who voluntarily come to the clinics;
- Did not include hospitalized and other less healthy subjects;
- Health status was only defined as the functional ability (active or inactive) of the respondents → others definitions should be considered (e.g. non-depressed or depressed);
- Covariates other than gender should be considered (e.g. smoking status, exercise regularity, etc.).

Conclusion & Discussion

Conclusion

- The probability of transition rate from inactive to active states decrease with age;
- Female older adults are more likely to have lower probability of transition rate from inactive to active;
- The probability of transition rate from active to inactive states increase with age;
- Female older adults are more likely to have higher probability of transition rate from active to inactive;

Conclusion

- At age 85 and below, male adults tend to have higher probability of improving health status, but this situation doesn't occur among females;
- Females tend to have a higher probability of health transition for remaining in an inactive state than males;
- Males appear to experience a higher probability of dying than females; and this gender difference increase with age.

Conclusion

- Active elderly were expected to live much longer than inactive elderly;
- Females have a longer life but in an inactive state;
- Females have a lower percentage of active life expectancy to life expectancy;

Discussion

- Preventing the elderly from entering an inactive state of physical health;
- Providing more home-based and community-based supporting services;

Future Study

Future Study

- More other covariates should be included;
- Younger subjects (age <65) should be included in the study;

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Thank You

Comments are welcome

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