



Using Taiwan National Health Insurance Database to Explore the Need of Long-term Care

Jack C. Yue

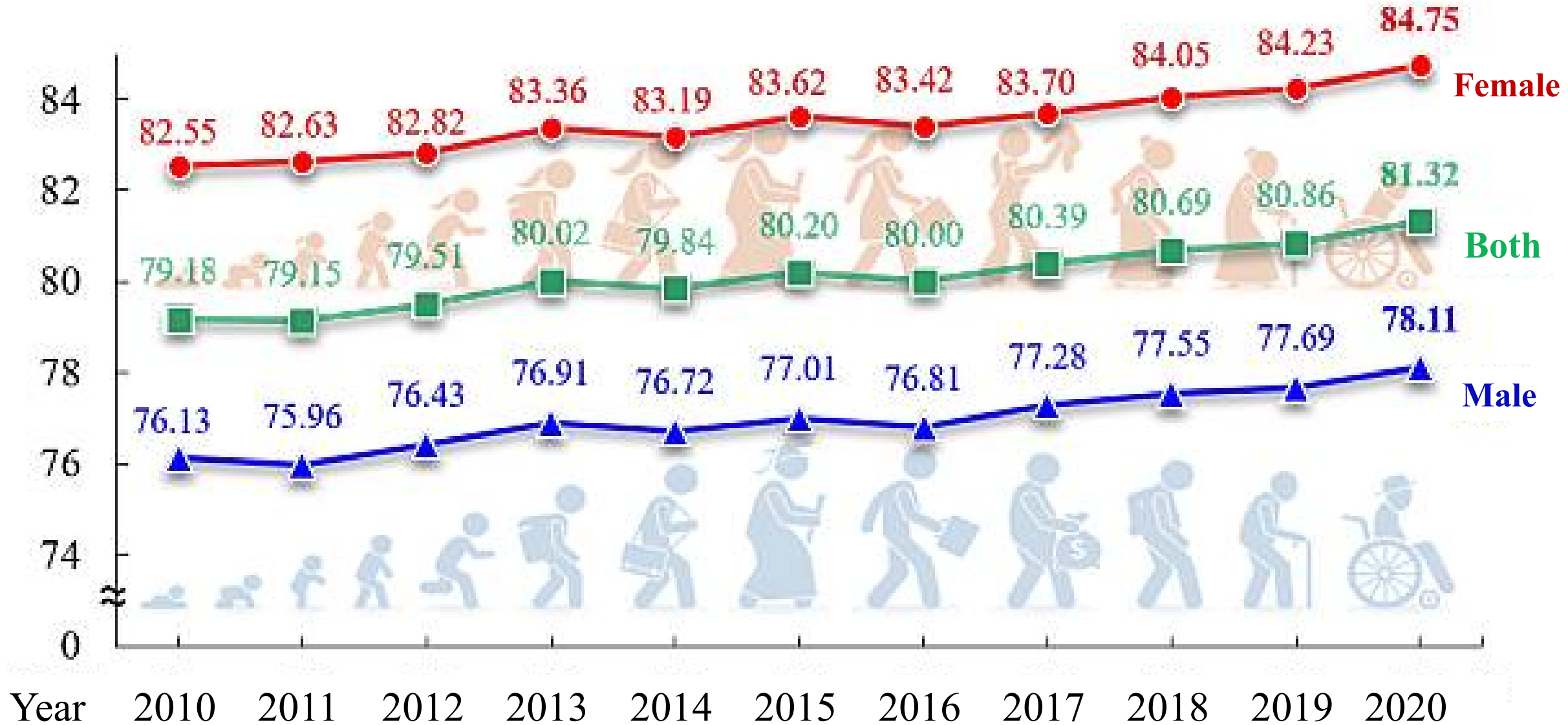
National Chengchi University

csyue@nccu.edu.tw

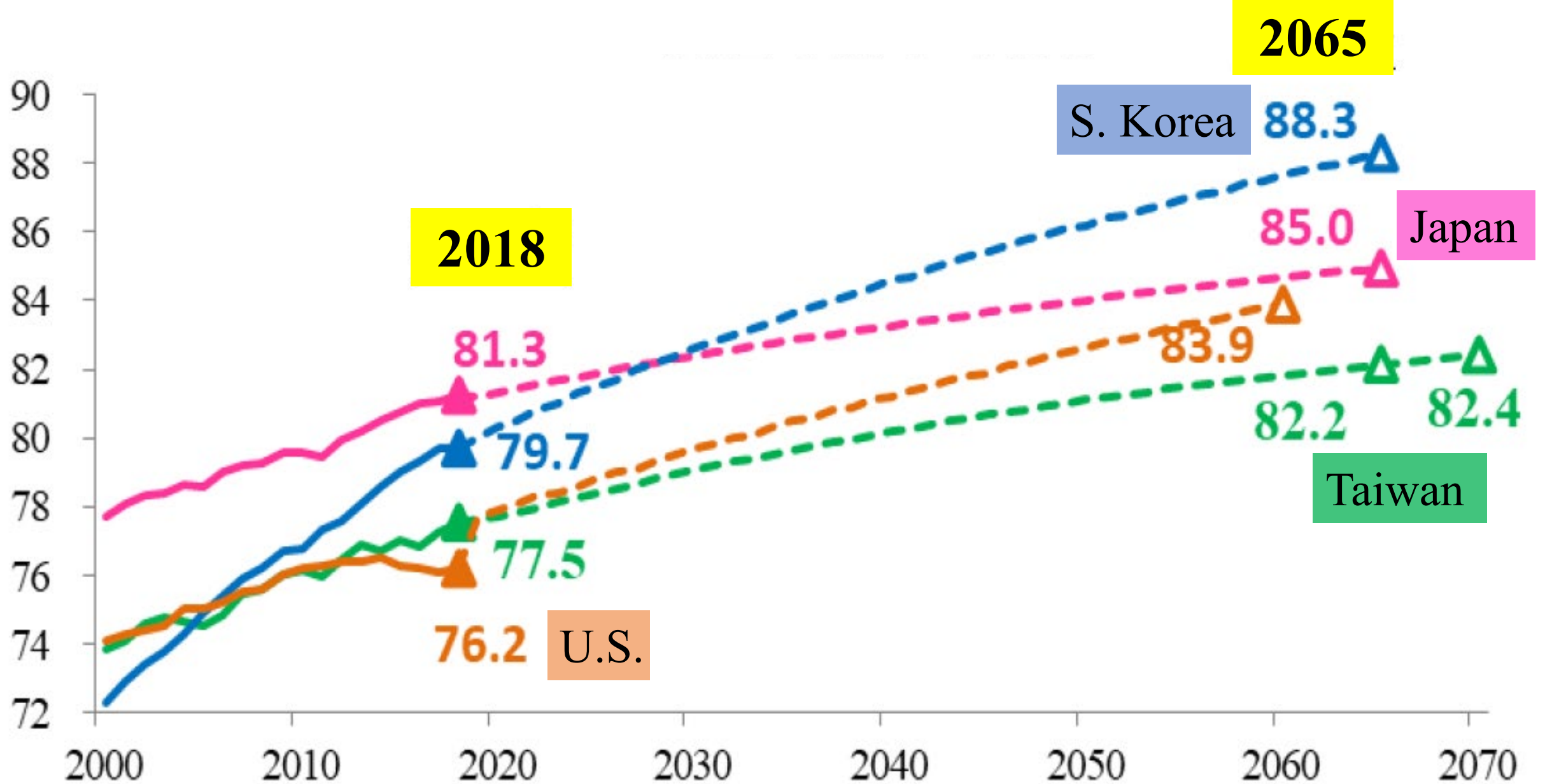
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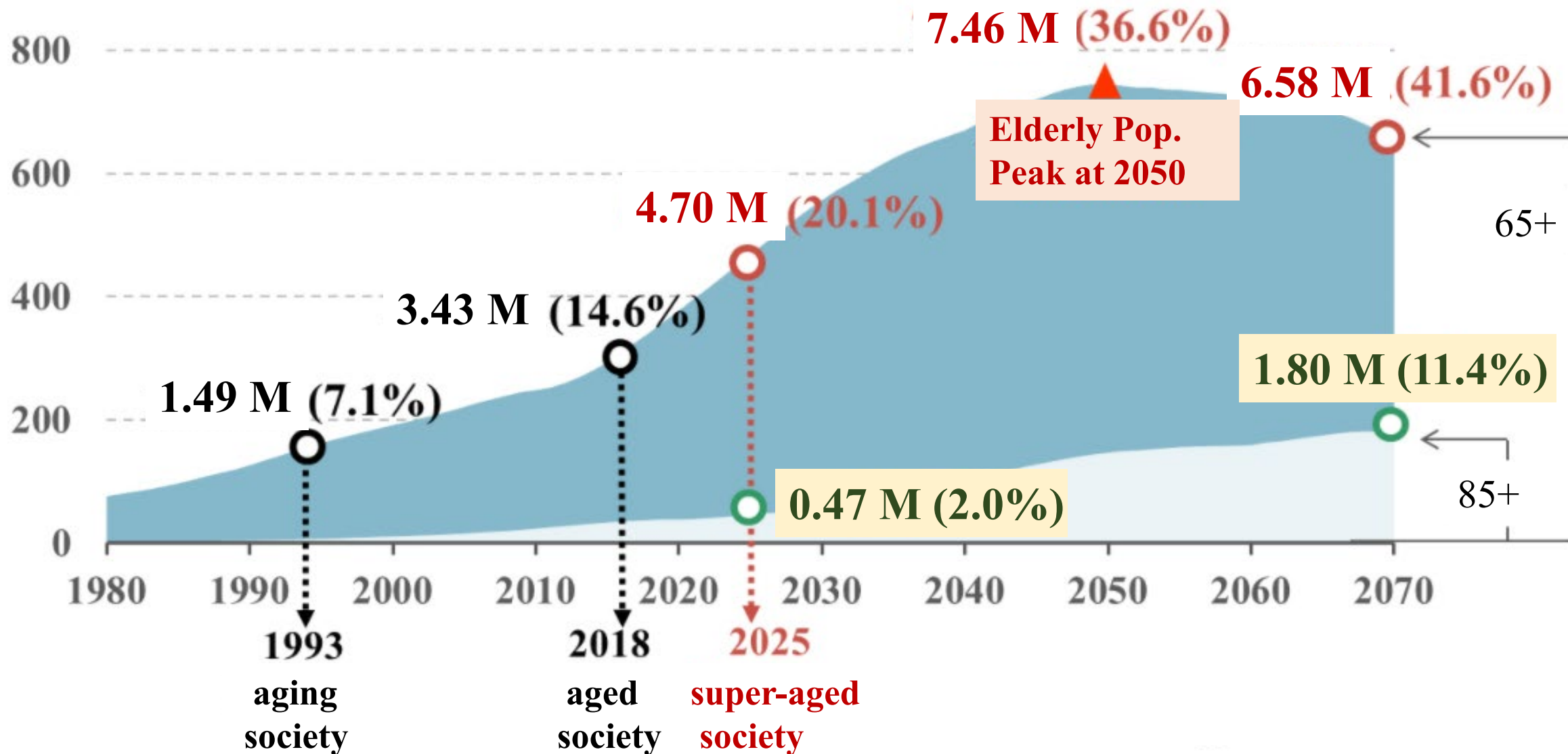
Life Prolonging Continues in Taiwan...



Increasing Life Expectancy for many Countries



Accelerating Population Aging in Taiwan



Source: National Development Council "Taiwan Population Projection (2020~2070)"

Needs of Prolonging Life

- ❑ Increasing life expectancy has been a common phenomenon and the proportion of elderly is expected to rise.
→ Planning for retirement life:
 - 1) Financial needs (e.g., Pension insurance);
 - 2) Medical needs (e.g., Medical insurance);
 - 3) Daily living (e.g., Long-term care insurance).
- ❑ Taiwan government has been planning long-term care (LTC) insurance for more than 20 years.

Meeting the Elderly's Need

Financial



- 1 National Pension
- 2 New Retire. Pension

Medical



- 1 National Health Insurance

Care



Long-term
Care
Insurance ???

Difficulties for Planning LTC Insurance

- ❑ Unlike pension plan, there are more difficulties in designing LTC insurance, including lacking experience data.
- ❑ There are quite a lot of criteria judging the LTC needs.
 - Activities of Daily Living (ADL) & Instrumental ADL (IADL):
Commercial insurance
 - Barthel Index/Scale: Foreign labors
 - International Classification of Functioning, Disability, and Health (ICF): Taiwan government's current choice

LTC Projection in Taiwan

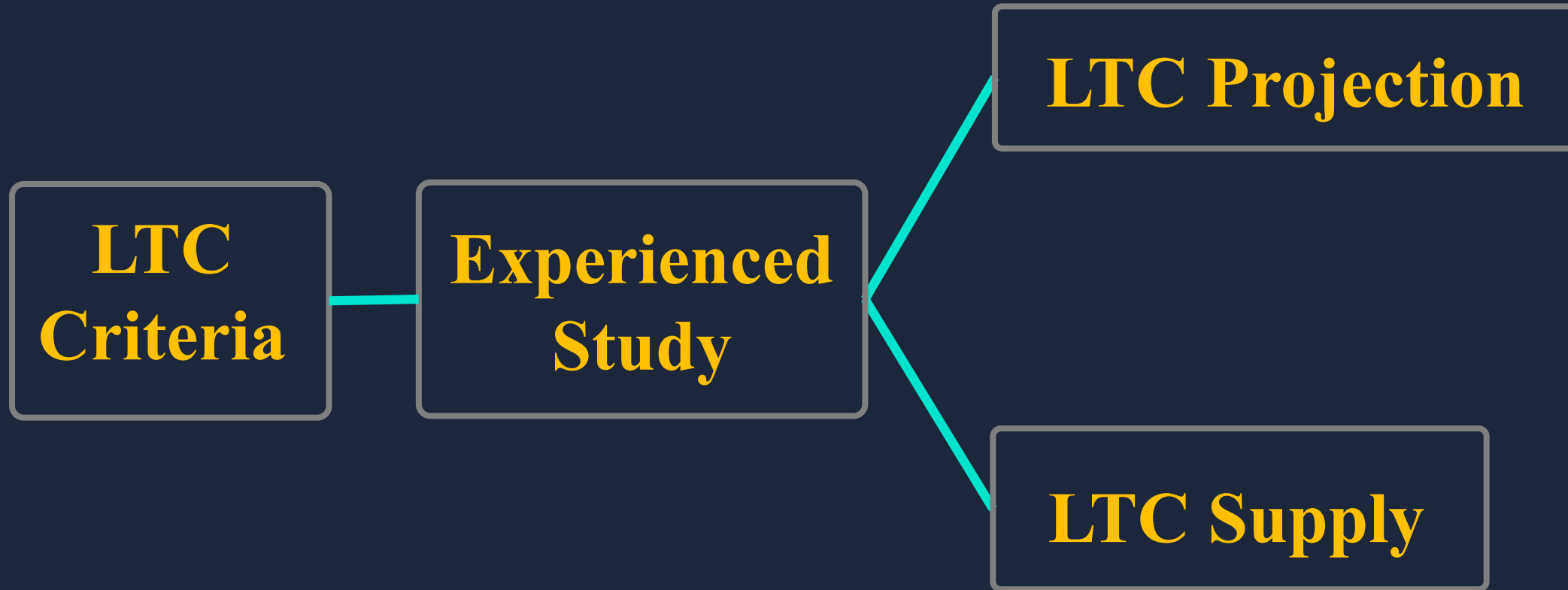
- ❑ Common assumption of Taiwan LTC studies:
 - Pay-as-you-go system
 - ADL, IADL and some with cognitive dysfunction
 - Fixed incidence Rate from sampling surveys
 - Population projection from National Development Council
- ❑ These projections were likely to be under-estimated.
 - Reducing mortality rates & increasing incidence rates?
 - Larger experienced data (Census)?
 - Other LTC criteria?

Review of Past Studies

- Wu et al. (2002 & 2003) “Evaluating Taiwan’s Long-term Needs”
- Cheng et al. (2003) “The Projection of Long-Term Care Expenditure in Taiwan”
- Kao et al. (2004) “Preliminary Estimation of the Supply and Demand of Long-term Care Services in Taiwan”
- Cheng, W. and Lin, C. (2004) “A Study of Feasibility of Long-term Care Insurance in Taiwan”
- Wang et al. (2010) “The Projection of Disabled Population, Population with Dementia, and Care Workers in Need in Taiwan”
- Cheng et al. (2012) “Constructing an Actuarial Simulation Model for Social Long Term Care Insurance in Taiwan”

Study Goal

- **Design LTC insurance and project Taiwan's LTC**



Catastrophic Illness Database

Advantages

- ❑ National Health Insurance Research Database (Census)
- ❑ Age-specific incidence and mortality rates
- ❑ Objective criteria based on Catastrophic Illness (CI)

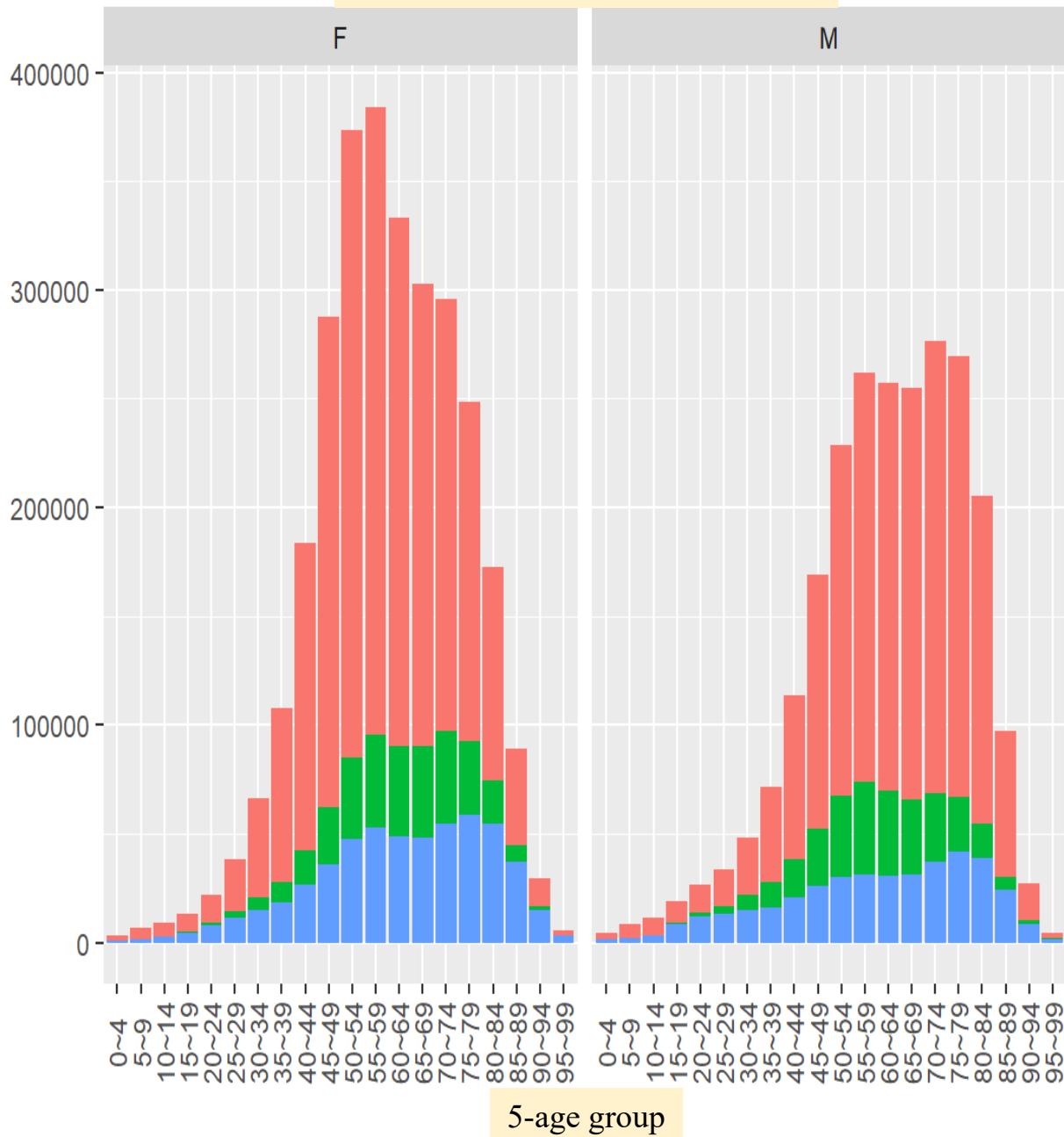
Restrictions

- ❑ Cover needs of injury and illness (not ageing)
 - not suitable for national level social insurance
 - Dementia is not fully covered
- ❑ Commercial insurance??

LTC Judging Criteria

Group	Catastrophic Illness
1	Cancer
4	Chronic Renal Failure
5-3	Rheumatoid Arthritis
6-1	Senile and Presenile Organic Psychotic Conditions
12	Major Trauma
13	Patients Requiring Long-term Use of a Respirator
15	Air Embolism
16	Myasthenia Gravis
18	Spinal Cord Injury
20	Cerebrovascular Disease (Acute)
21	Multiple Sclerosis
28	Motor Neurone Disease
29	Creutzfeldt-Jakob Disease

People with LTC



Age Restrictions

All Ages

65+

Respirator

Other 10

Spinal Cord

Groups

Creutzfeldt-Jakob

Methodology

1 Lee-Carter Model

→ $\ln(m_{xt}) = \alpha_x + \beta_x \kappa_t + \varepsilon_{xt}$

→ Incidence, mortality, and prevalence rates

2 Cohort Component Ratio (CCR)

→ $R_x(t) = P_{x+1}(t+1)/P_x(t)$, $P_x(t)$: Population age x time t

→ Projecting LTC population

Methodology (conti.)

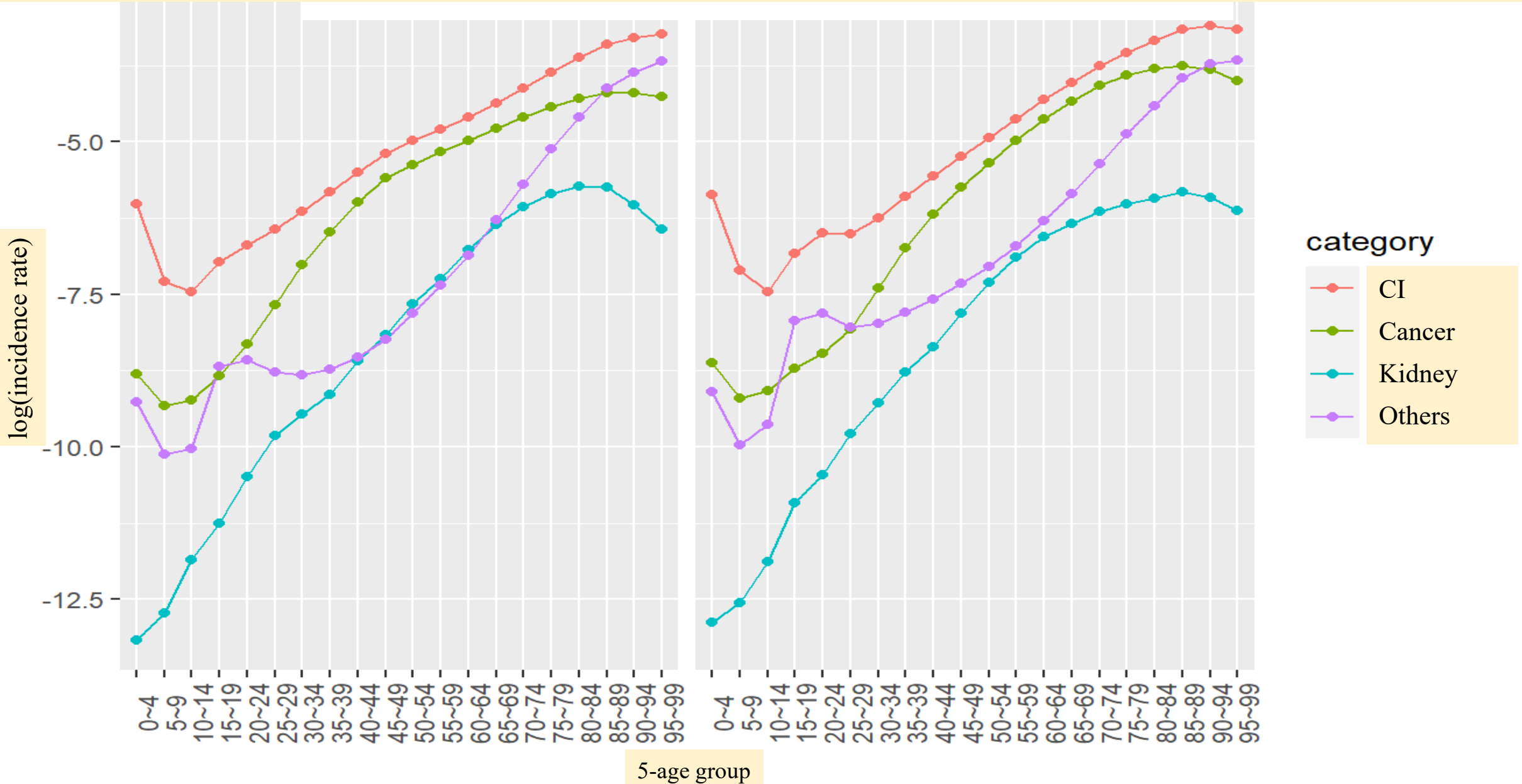
③ Spatial Analysis

- The location (county level) of outpatient visits with Fee < \$550 NT, about USD20 (Yue et al., 2020)
- Incidence, mortality, and supply

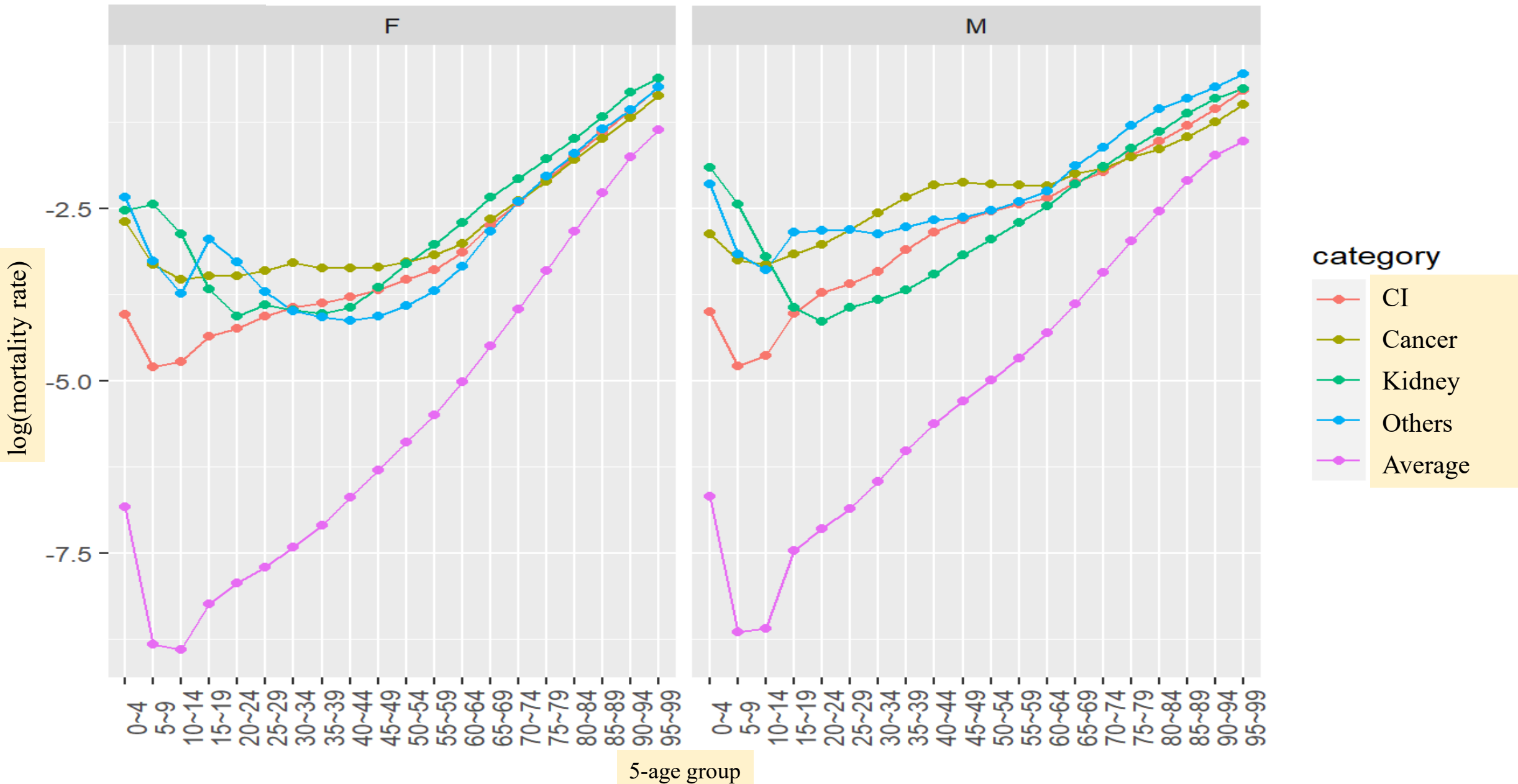
④ Life Table Construction

- Graduation methods (e.g., kernel)
- Life Expectancy

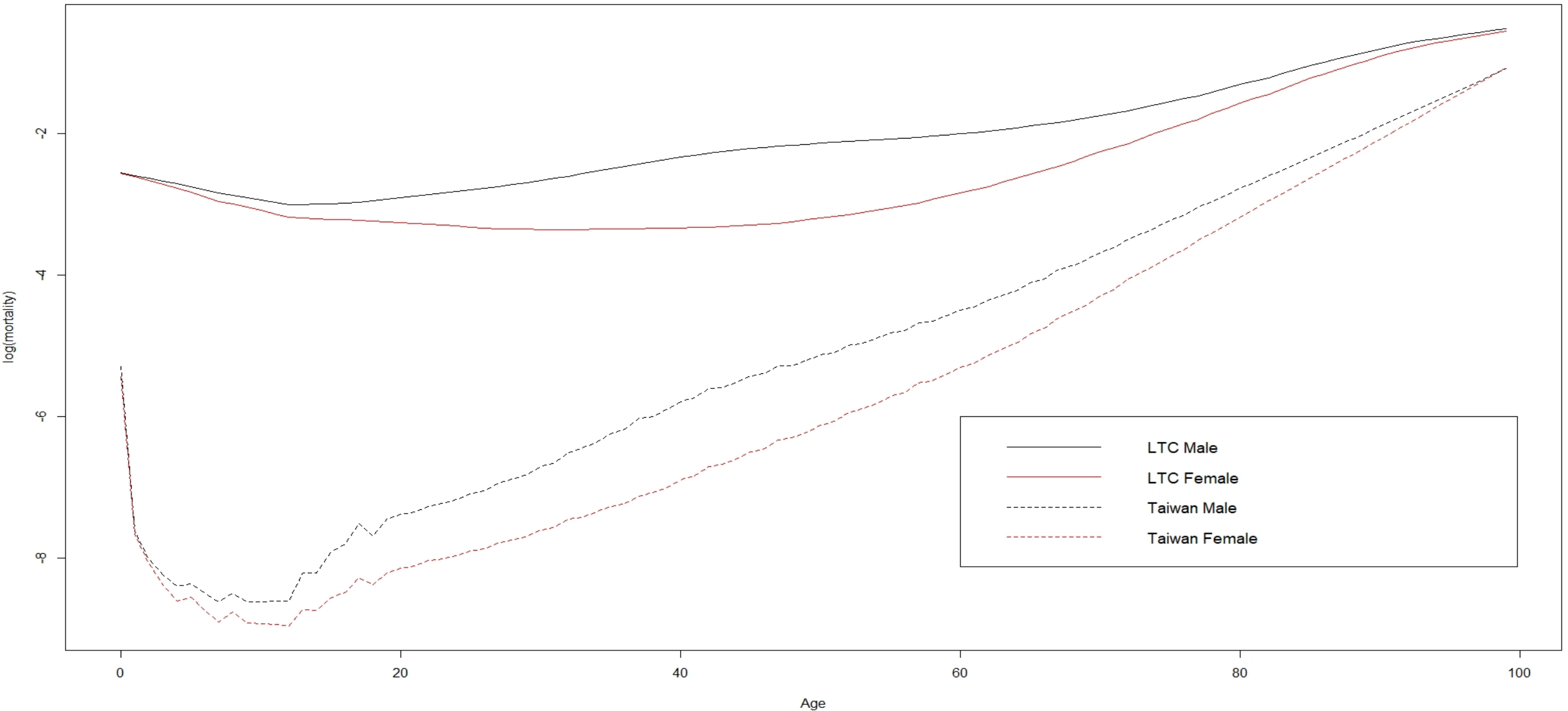
Incidence Rates of various CI categories (2003-2013)



Mortality Rates of various Groups (2003-2011)



Mortality Comparison (Average vs. LTC, 2009-2011)



Life Expectancy Comparison (Average vs. LTC, 2009-2011)

Age		0	10	20	30	40	50	60	70	80	90
Average	Female	82.47	72.98	63.11	53.32	43.65	34.21	25.15	16.76	9.76	4.67
	Male	75.96	66.51	56.72	47.14	37.94	29.35	21.32	14.11	8.38	4.29
LTC	Female	19.48	23.15	22.85	21.06	18.09	14.23	10.05	6.29	3.50	1.83
	Male	15.02	15.58	13.15	10.51	8.40	7.19	6.01	4.44	2.81	1.64

LTC Experienced Data

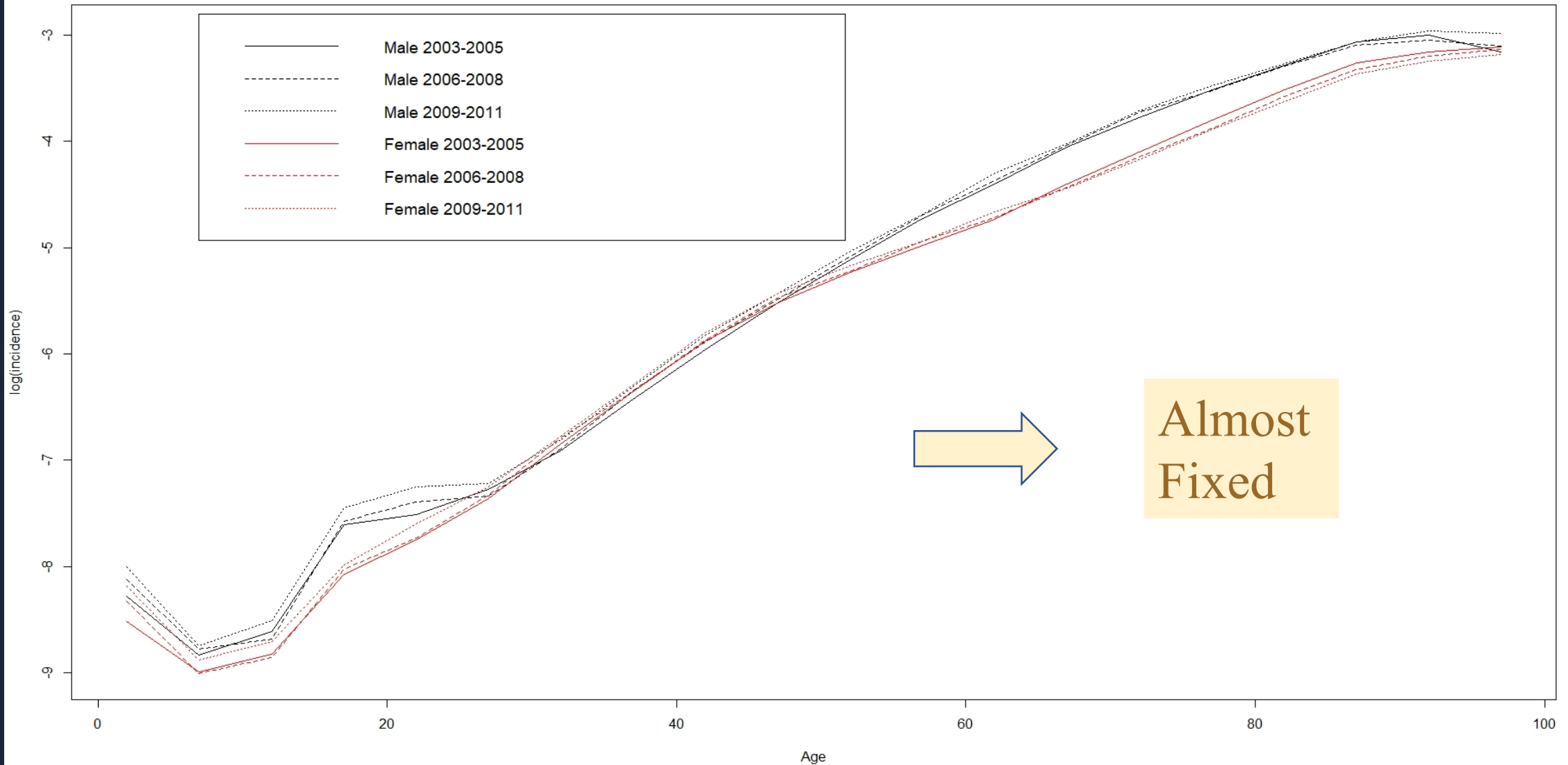
□ Mortality Rates

- CI and LTC patients have larger mortality rates
- LTC patients have shorter life expectancy

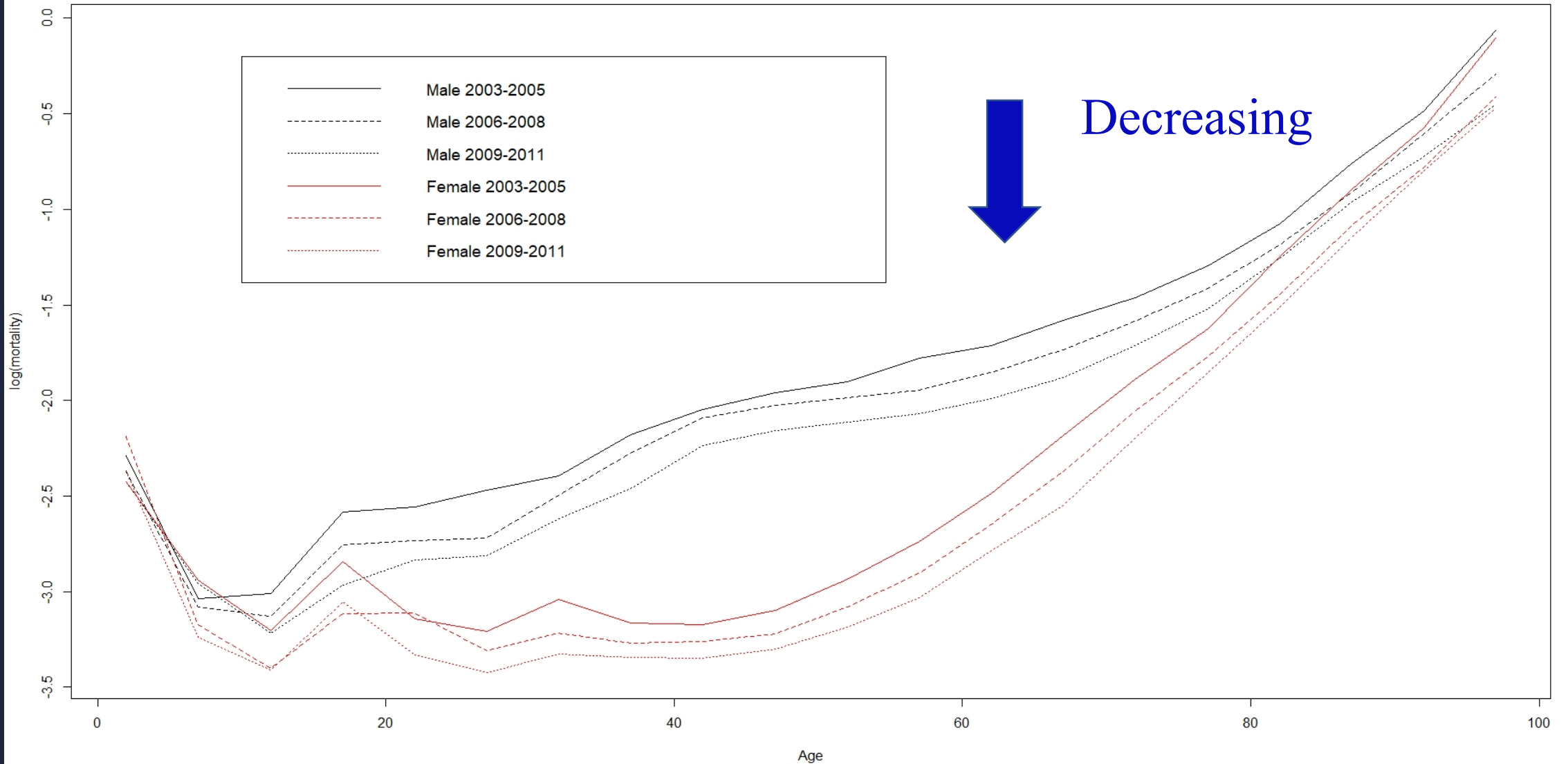
□ Incidence Rates

- Incidence rates of Cancer are the largest and those of Chronic Renal Failure are the smallest

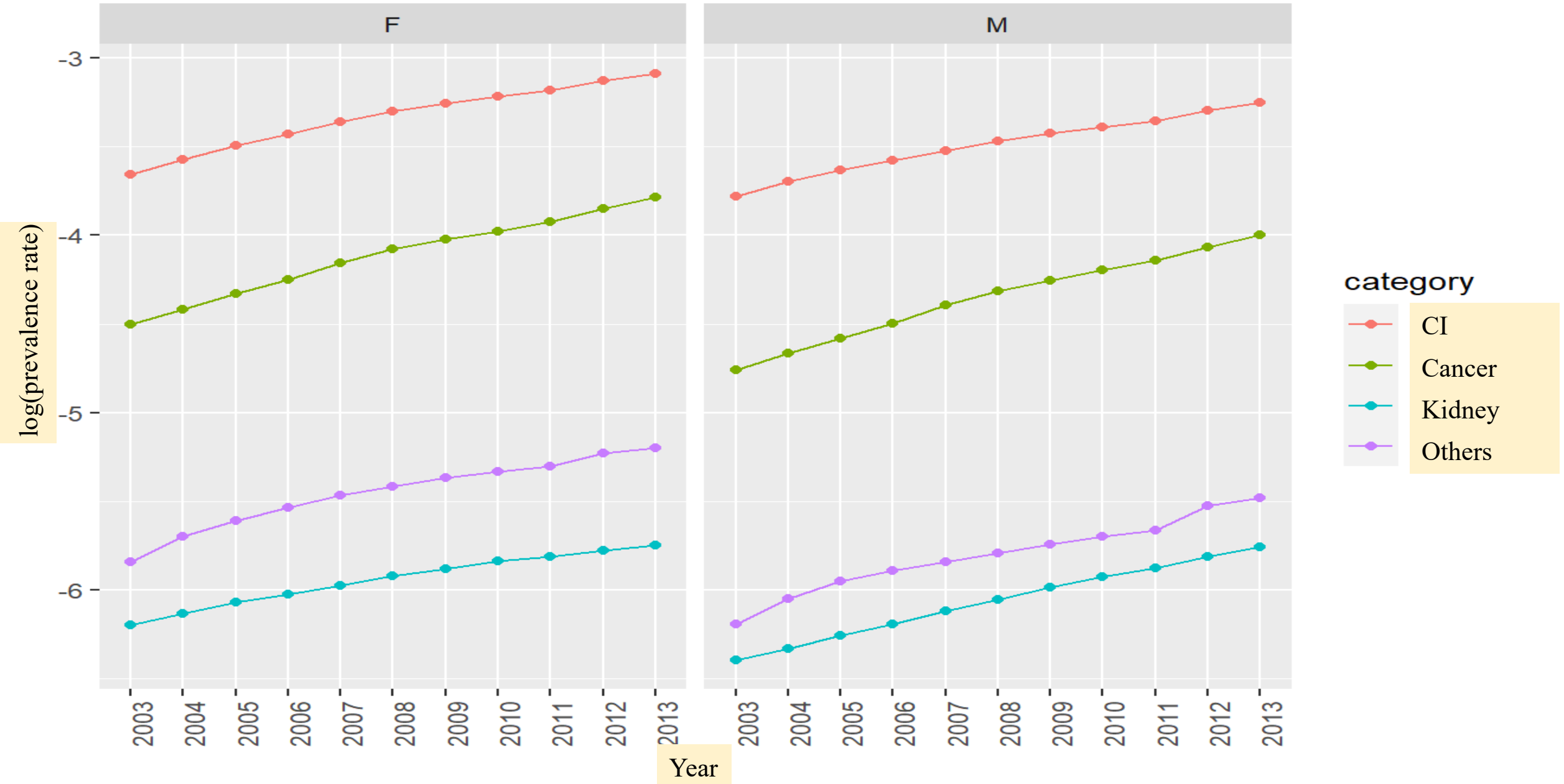
LTC Incidence Rates (2003-2011)



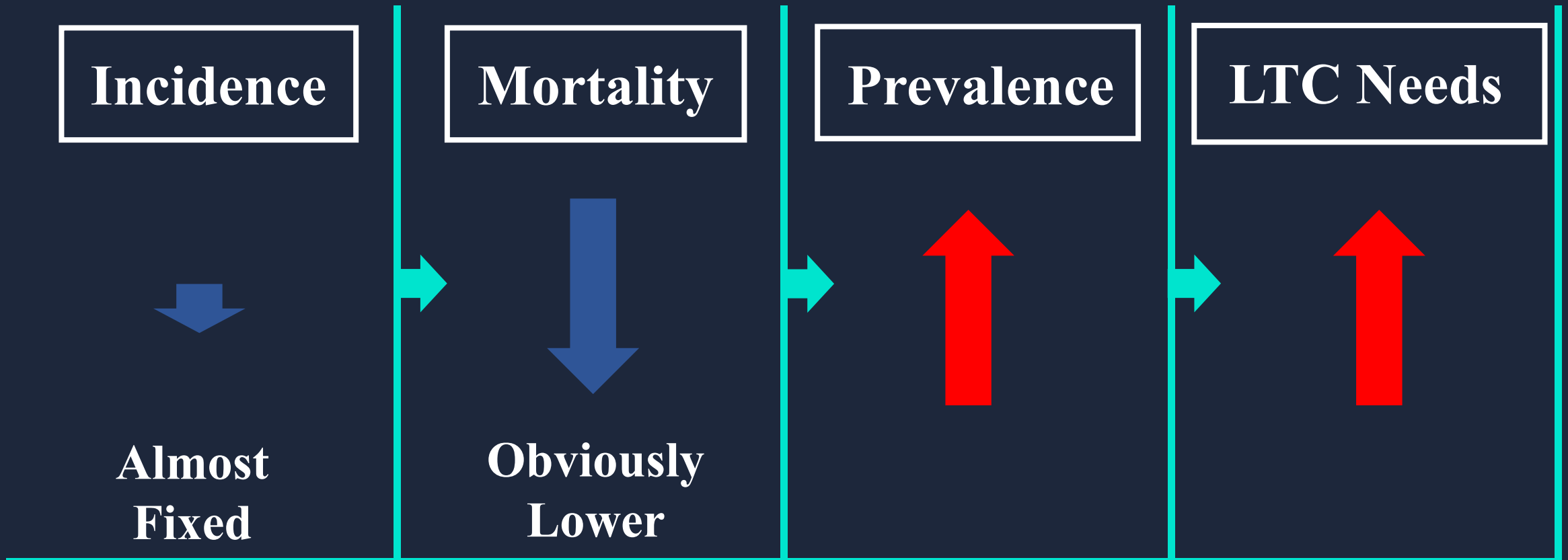
LTC Mortality Rates (2003-2011)



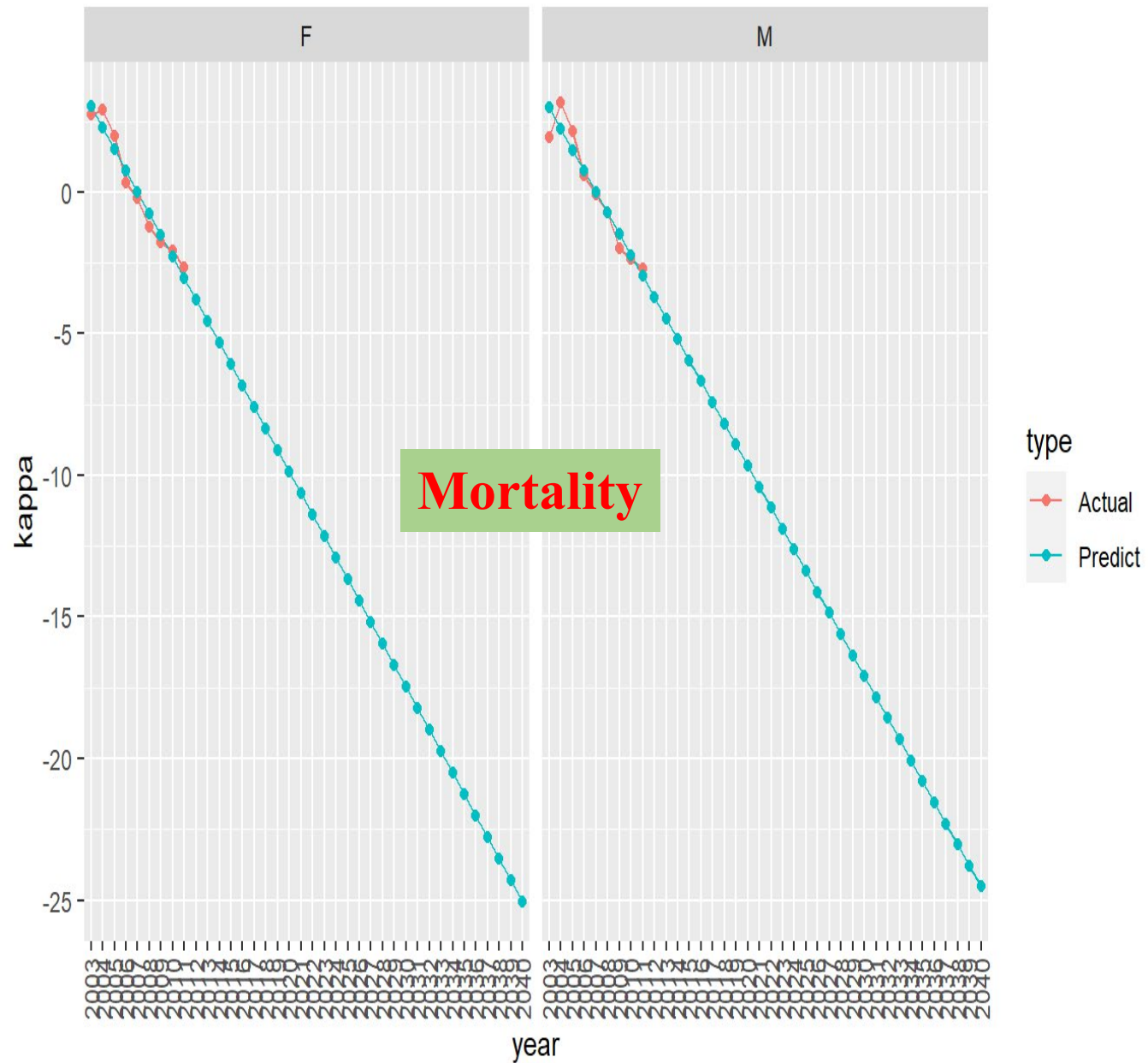
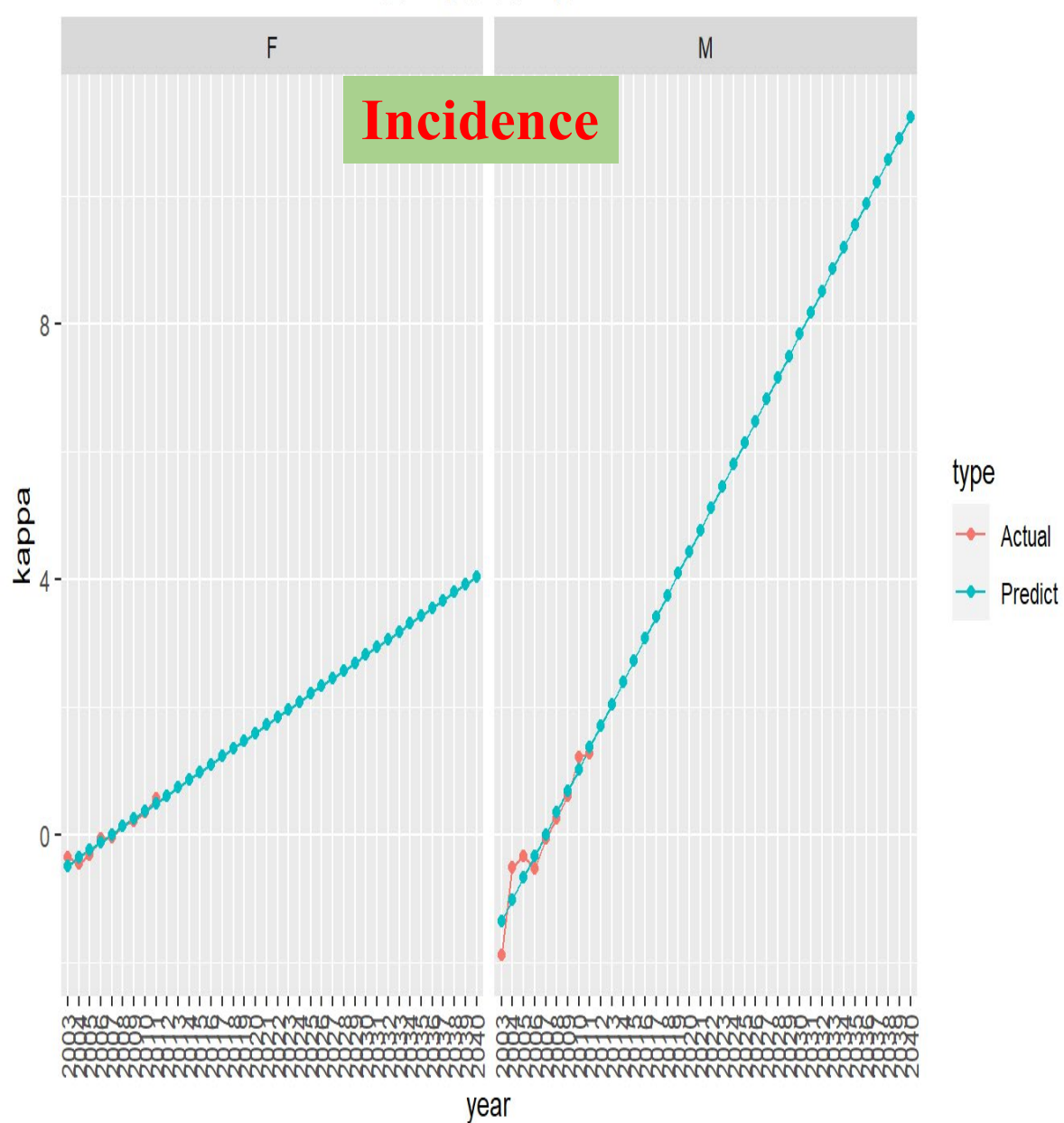
Prevalence Rates of various Groups



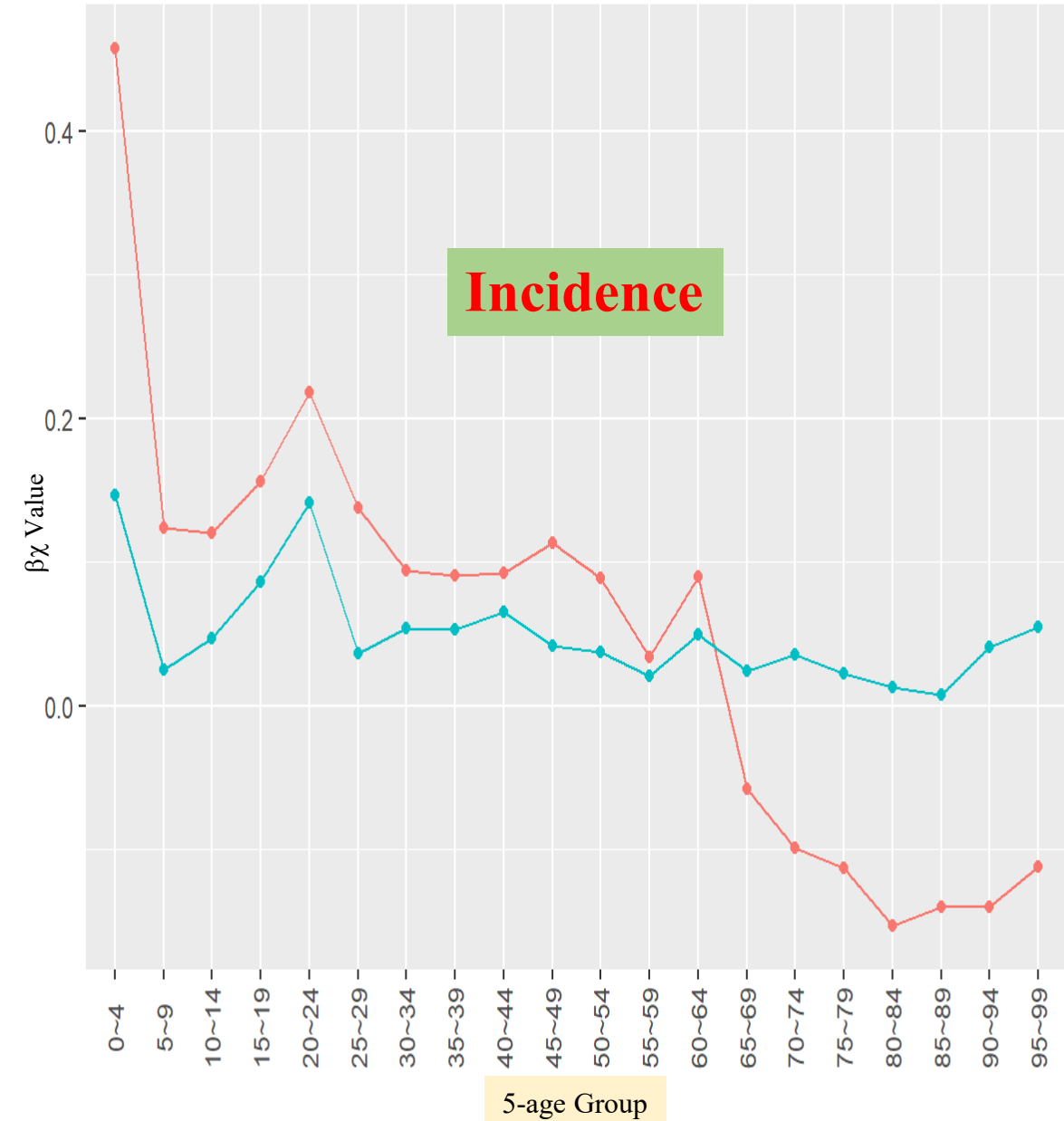
LTC Trend



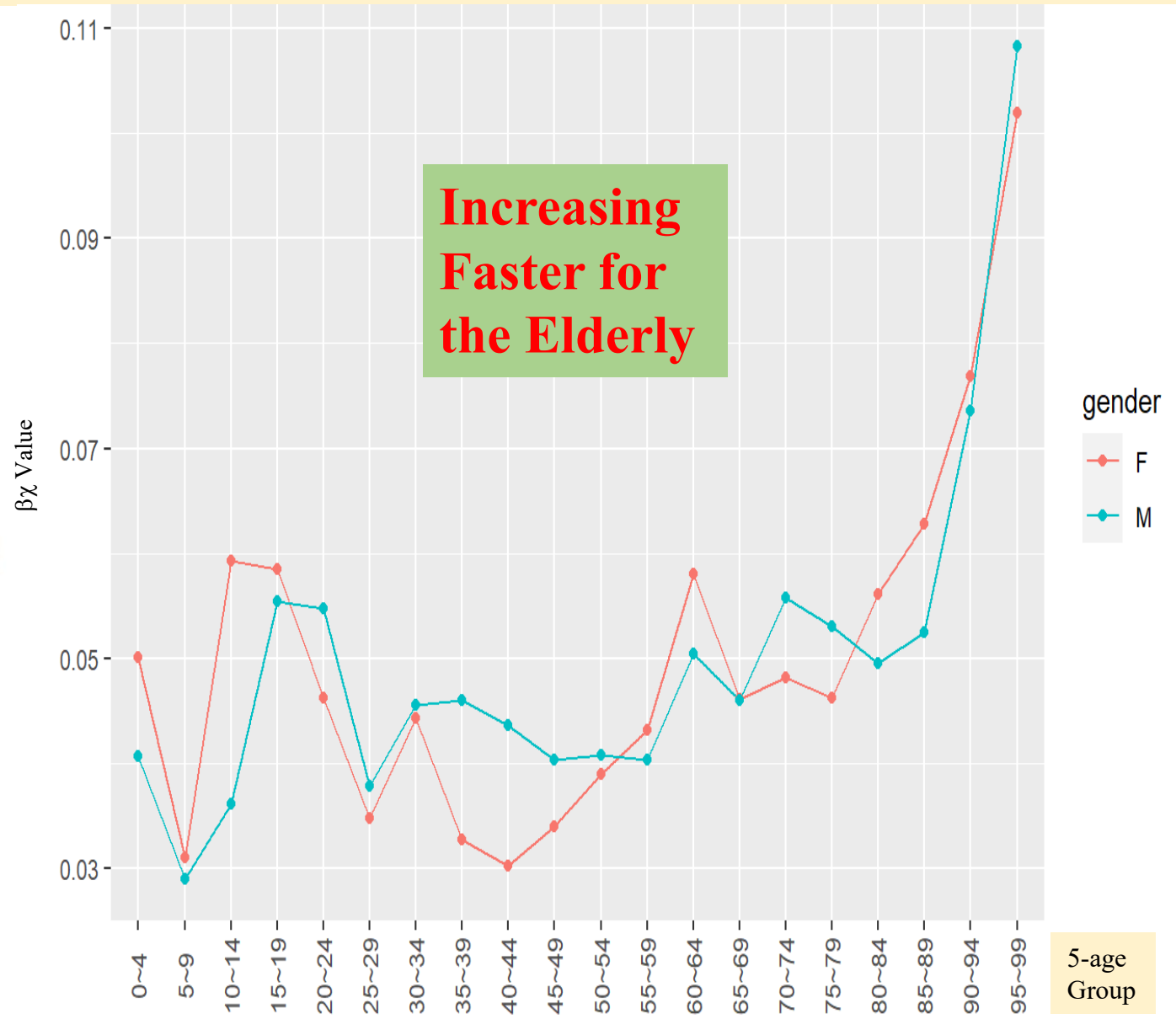
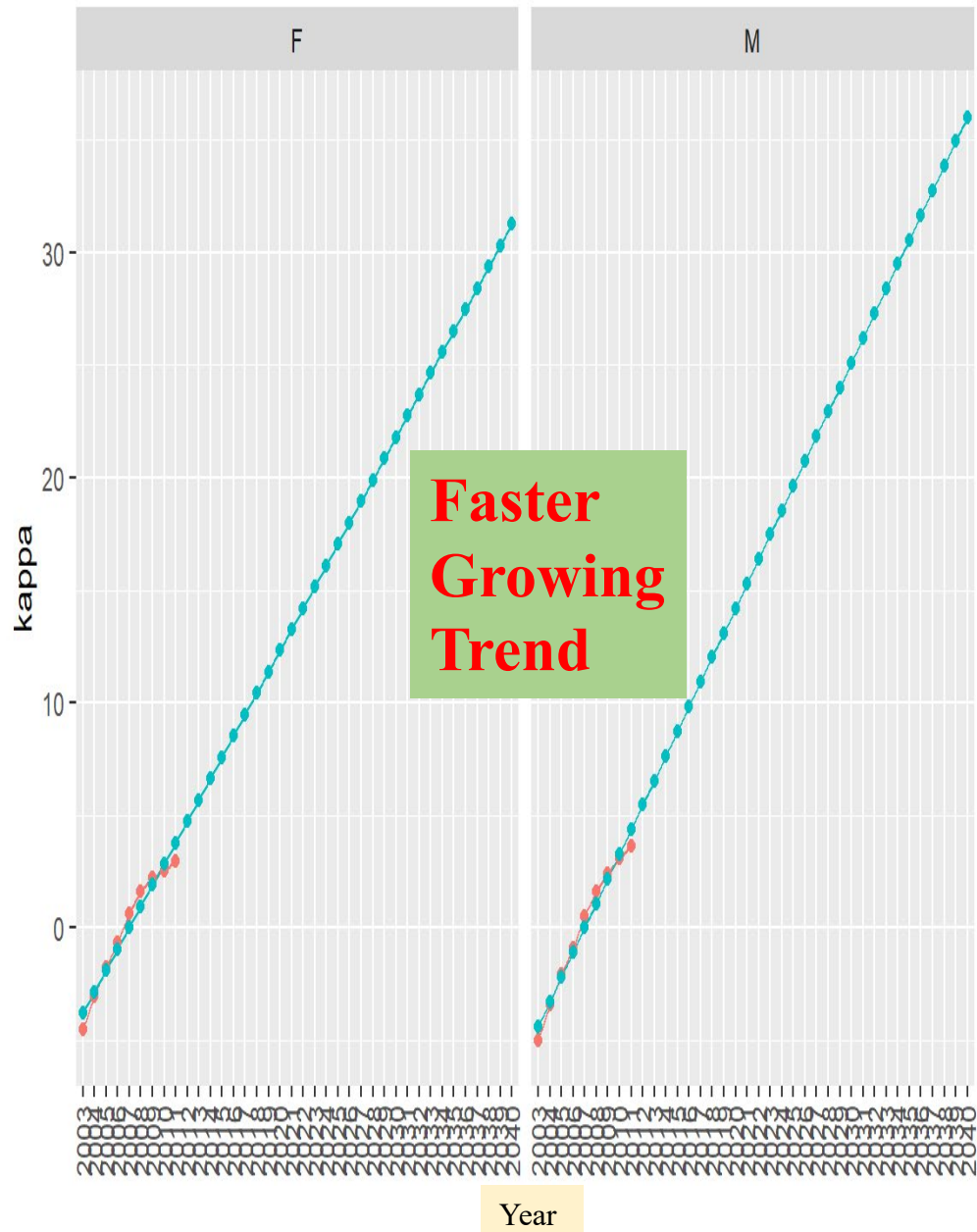
κ_t Trends for Incidence and Mortality Rates (LC model)



β_x of Incidence and Mortality Rates (LC model)



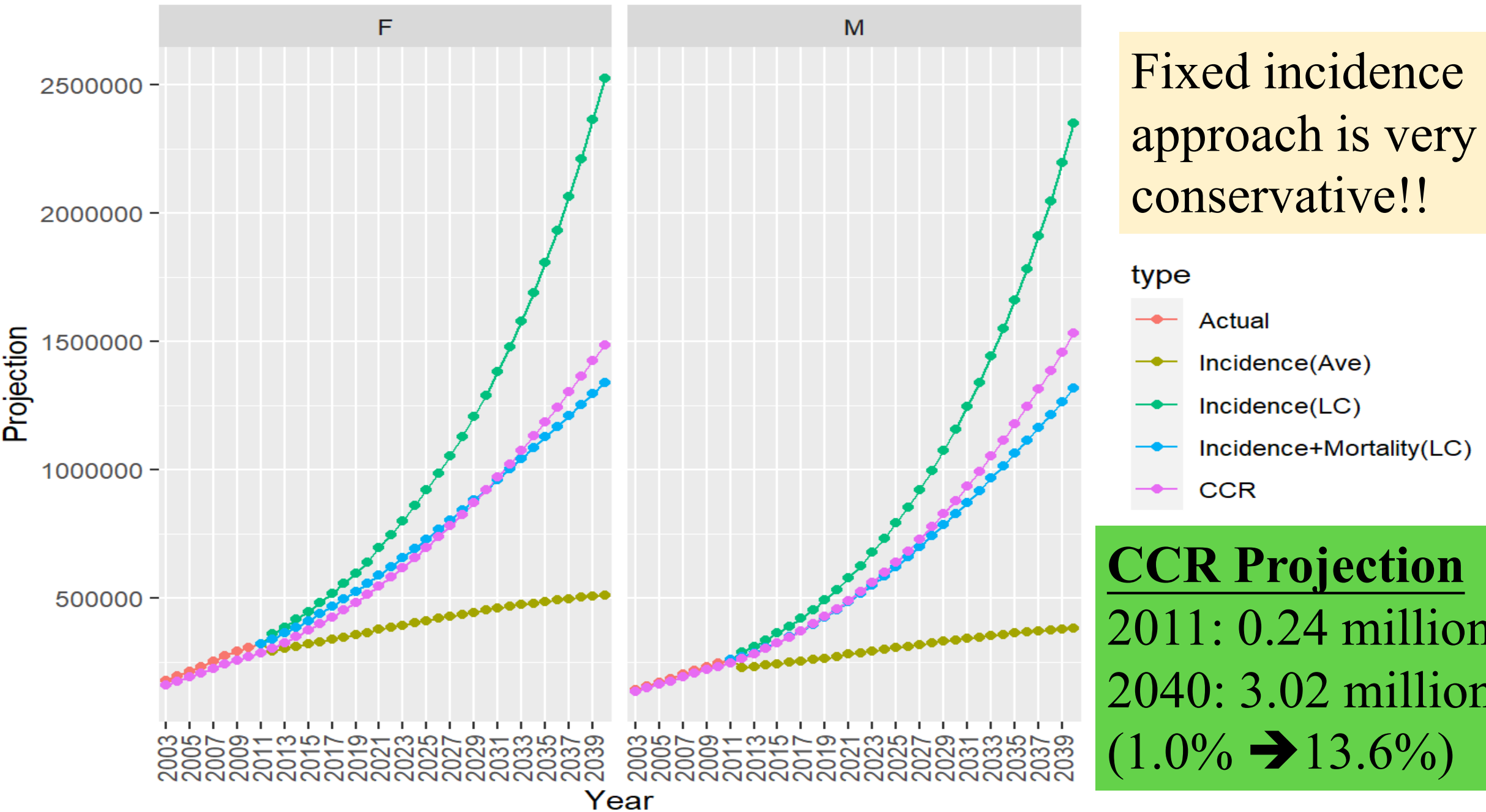
LTC Prevalence Rates (LC model)



LTC Projection Methods

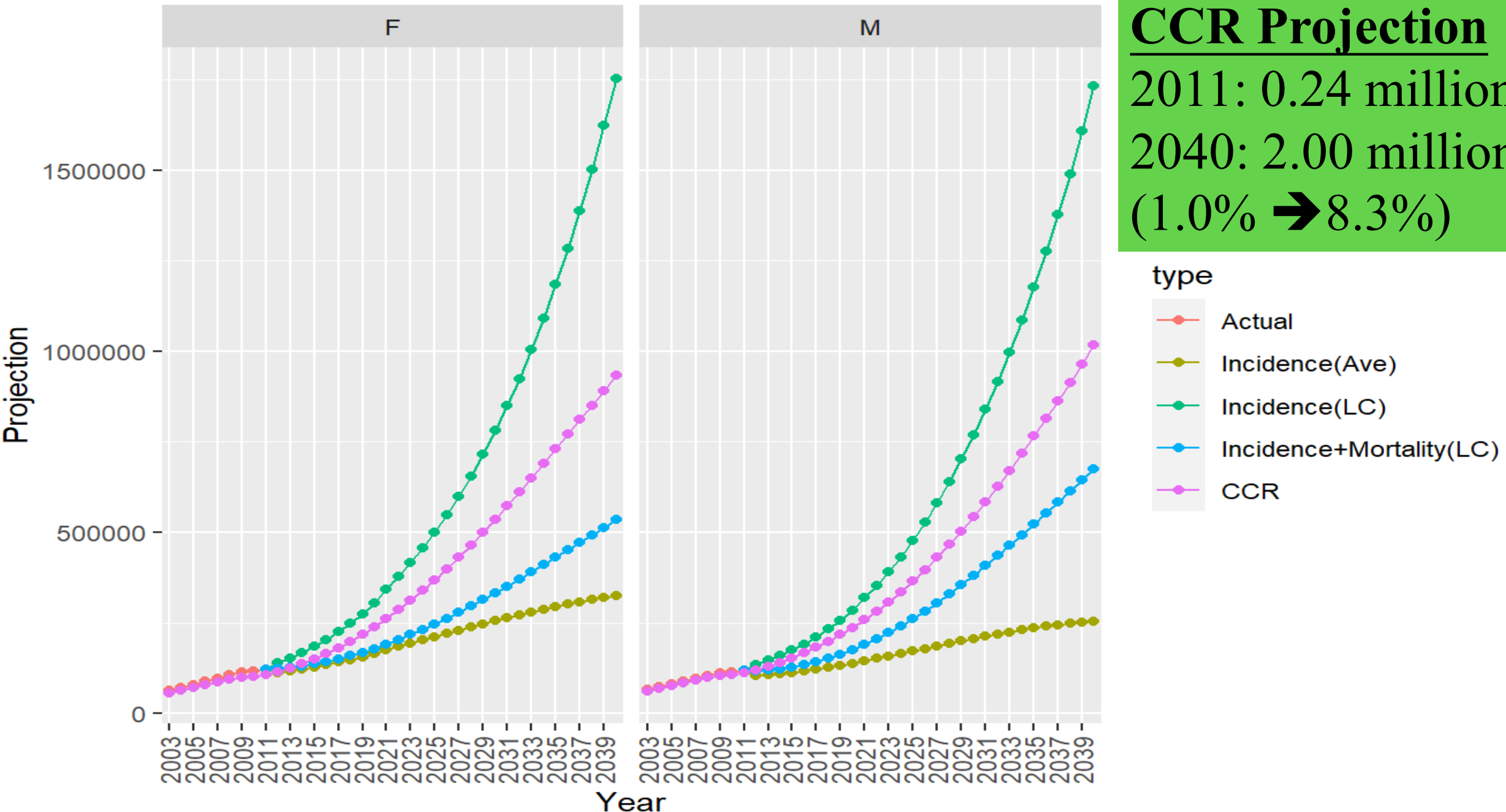
- ❑ **LTC demand will increase in Taiwan**
- ❑ **There are quite a few projection methods**
 - **Fixed incidence rates (& National Projection)**
 - **LC incidence rates (& National Projection)**
 - **LC incidence-mortality (& National Projection)**
 - **CCR**

LTC Projection(2012~2040)



LTC Projection(2012~2040, Age Restriction)

CCR Projection
 2011: 0.24 million
 2040: 2.00 million
 (1.0% → 8.3%)



Expecting LTC Needs in Taiwan

- ❑ People with LTC conditions in Taiwan are expected to increase for all projection methods.
 - Ageing population + Reducing Mortality
- ❑ LTC burden will be too heavy for “pay-as-you-go” system
 - “CCR + Age Restrictions”: Premium will be 8 times in 30 years. (Increment larger than pension and medical insurance)
 - Individual account? (or Reducing LTC coverage?)

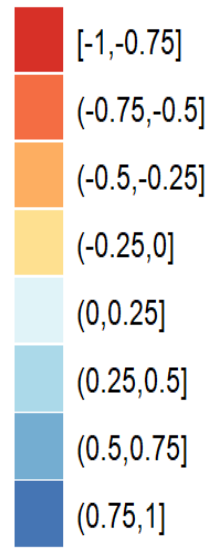
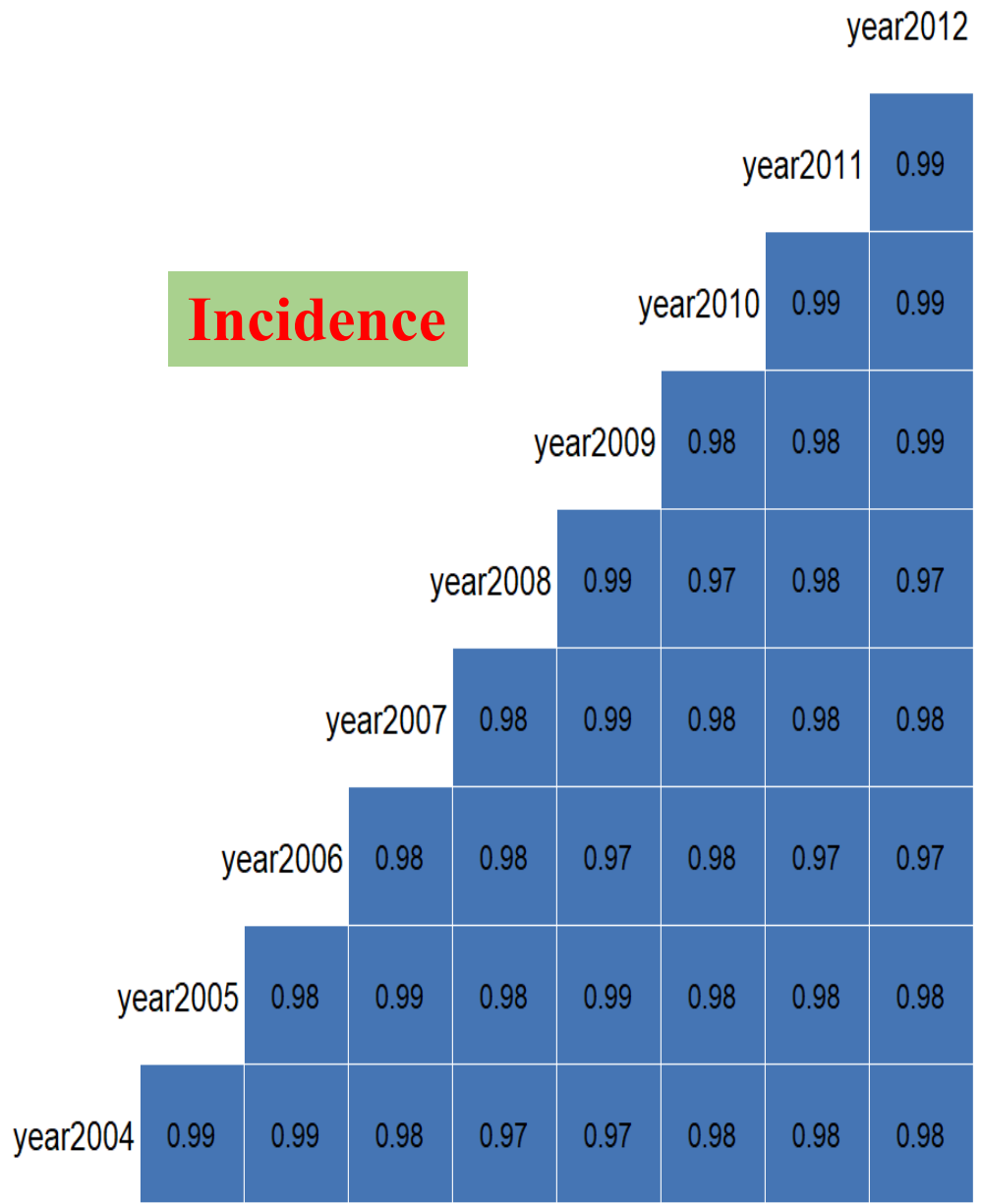
Spatial Analysis of LTC Needs

- ❑ We also consider spatial analysis for LTC needs in Taiwan.
 - Incidence/mortality rates between counties (and townships) are highly correlated (for different years)
 - There exists spatial inhomogeneity (autocorrelation)
- ❑ County-level LTC supply and demand of are correlated.

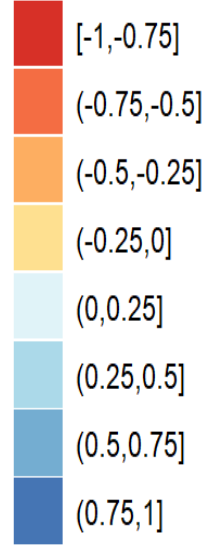
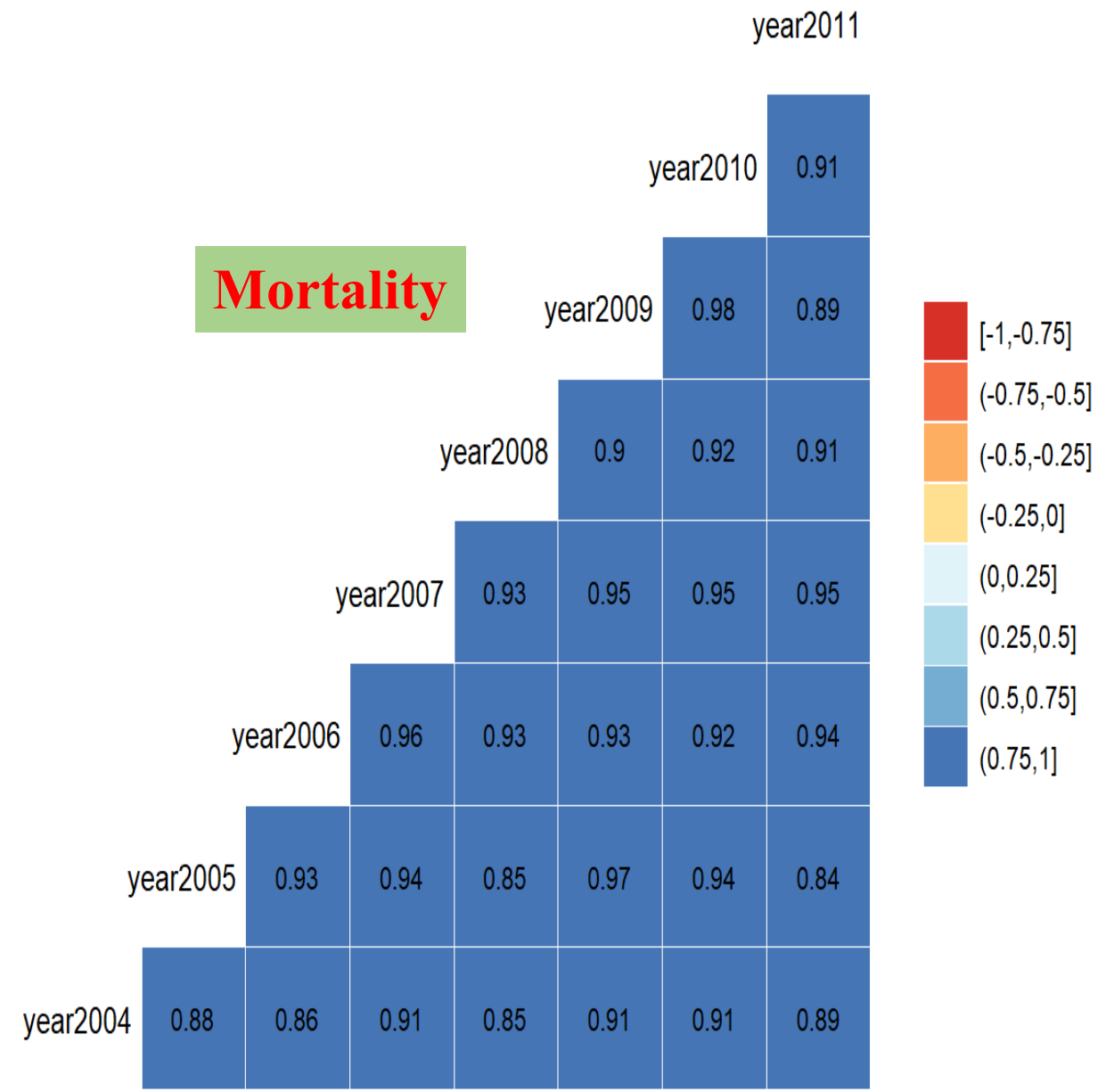
SMR	Moran's I	p-value
Cancer	0.379	<0.05
Cerebrovascular Disease	0.156	<0.05

Cancer Incidence (2004~2012) & Mortality (2004~2011)

Incidence



Mortality



Correlation of LTC Supply and Demand (County-level)

Year	Supply vs. Demand
2004	0.9403
2007	0.9288
2010	0.8865
2013	0.8149
2016	0.8212
2019	0.8341

Note: Family is still the main source for LTC in Taiwan (80%).

Conclusion

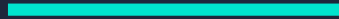
- ❑ Use catastrophic illness to design LTC insurance
 - Incidence and mortality rates via NHI Database
 - People with LTC conditions will increase rapidly and LTC burden is too heavy for “pay-as-you-go” system
- ❑ LTC needs are different county-wise
 - Incidence/mortality rates are spatially auto-correlated
 - LTC demand and supply grow at the same direction, but the supply does not match the demand.

Discussions

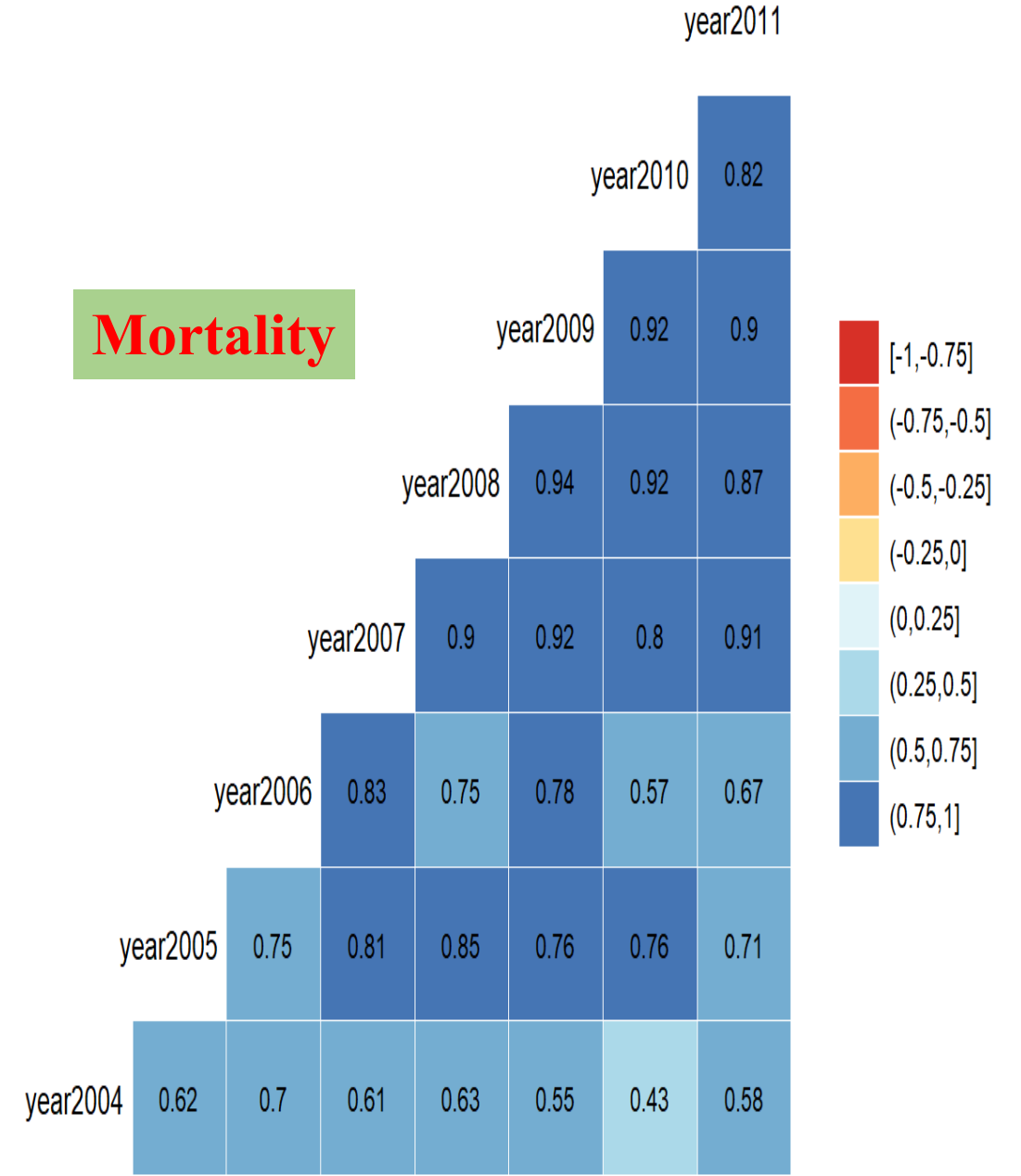
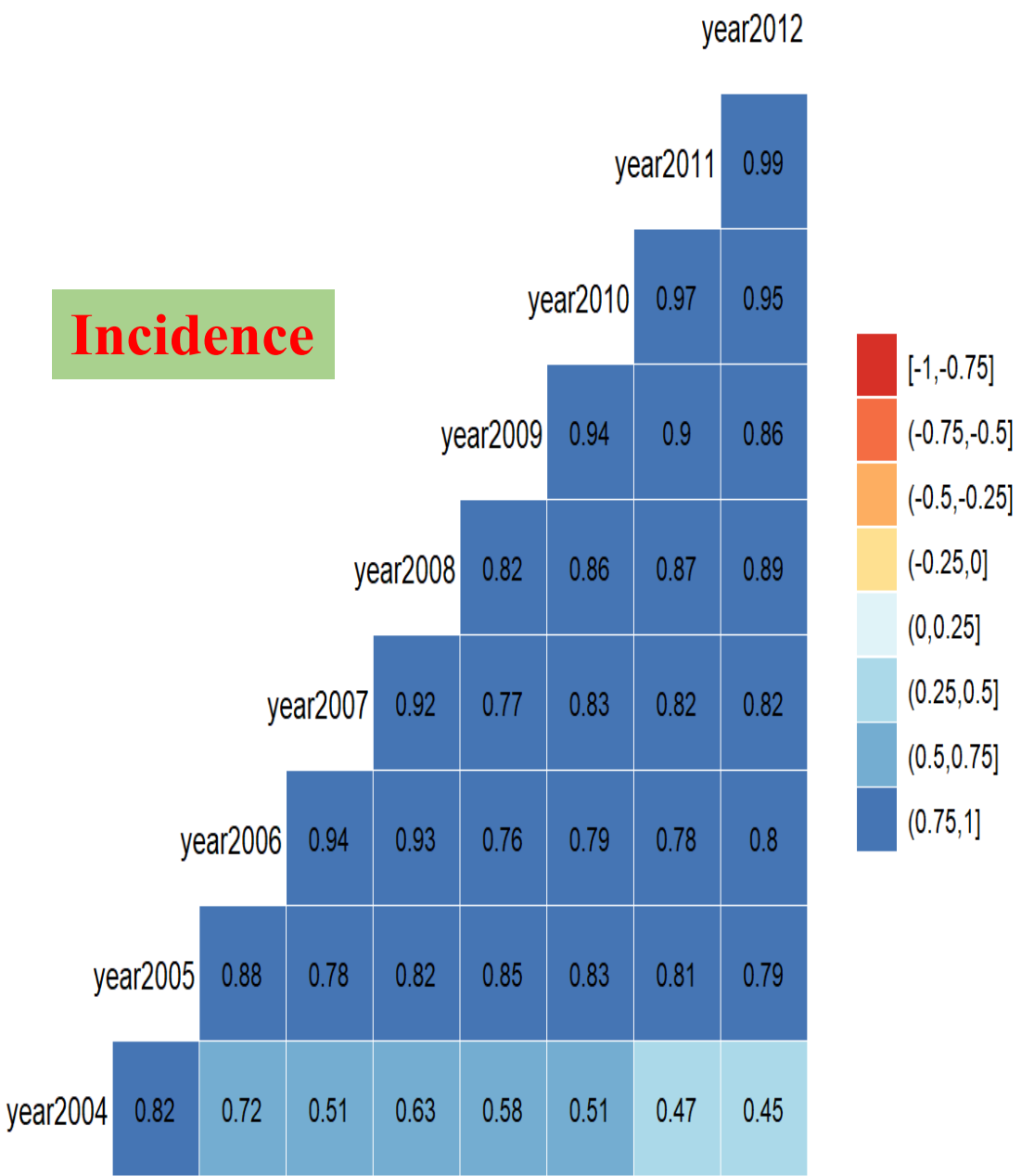
- ❑ LTC insurance should be implemented with care
 - “Pay-as-you-go” is too risky due to population ageing
 - It is also risky for “individual account” since incidence rates grow with age and life expectancy increase with time.
- ❑ Who should be responsible for LTC needs? **Longevity Risk!**
 - In Asia, living longer is a blessing and taking care of the elderly used to be the responsibility of the family
 - Defined Benefit to Defined Contribution?



THANK YOU!!



Psychotic Conditions Incidence (2004~2012) & Mortality (2004~2011)



Major Trauma Incidence (2004~2012) & Mortality (2004~2011)

